April 30, 1956 50 Cents

AVIATION WEEK

A McGRAW-HILL PUBLICATION

Single Sideband Cure For Radio Congestion

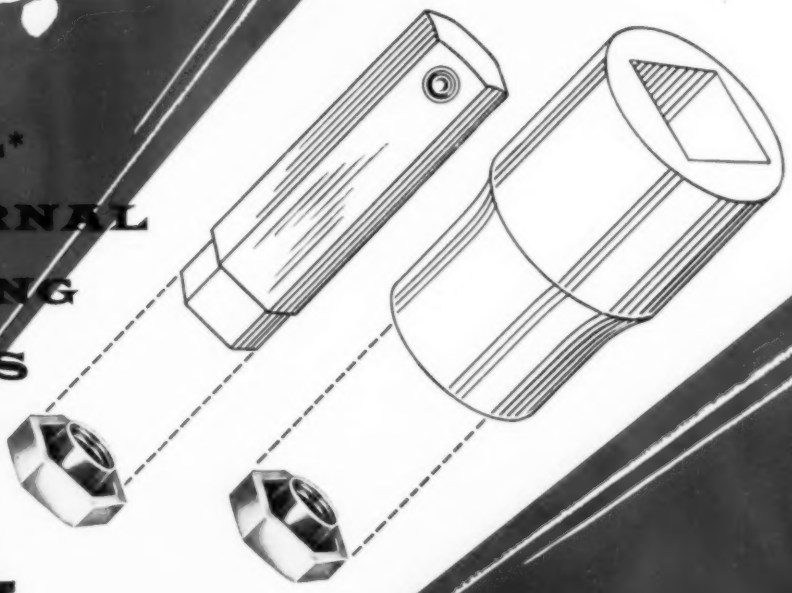
•

Pilot Capsule Passes Navy Feasibility Test

PSM Shepherds Airliner in Distress

NEW!

INTERNAL* or EXTERNAL WRENCHING HEX NUTS

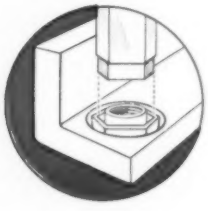


KAYLOCK

all-metal self-locking nuts

LIGHT WEIGHT • FULL STRENGTH • LOW HEIGHT

Another Kaynar first—the new KAYLOCK HEX NUT provides a substantial reduction in wrench clearances required for installation of AN363, AN364 and AN365 self-locking nuts. (Counter bore diameters, spot face diameters and edge distances may be greatly reduced.)



*Use internal wrench where access is limited. Write for Information on Wrenches.

Kaylock nuts are precision products produced in full conformance with Air Force-Navy specifications AN-N-5 and AN-N-10. For more information, write for our catalog.

THE KAYNAR COMPANY • KAYLOCK DIVISION • BOX 2001, TERMINAL ANNEX • LOS ANGELES 54, CALIFORNIA

Canada Distr: Abercorn Aero Ltd., Montreal

Ever hear the one about the mechanical mule?

New vehicle makes light work of ground-handling huge lighter-than-air craft

There was a time when docking and undocking an airship was a sizeable proposition—a chore requiring the manpower of a large ground crew.

Now Goodyear Aircraft Corporation, working with the Navy, has come up with the "Mechanical Mule"—a 4-wheel drive vehicle expressly designed for ground-handling and docking of airships.

Mounted with a huge cable-reel which works on the principle of a deep-sea reel, this mule never "balks"—keeps a positive yet gentle tension on the handling-line which is attached to the airship envelope.

As a result, a pair of Mechanical Mules—working on wheels which caster to permit "crablike" travel—can perform ground-handling duties which previously required 80-100 men.

The Mechanical Mule is an important contribution to the ever-growing airship program—an excellent example of the economy and conservation of manpower being exercised by the Defense Department.

It represents an important step forward in utilizing the versatile vigilance and unmatched station-keeping qualities of lighter-than-air craft in this nation's defense network.

It also shows how Goodyear Aircraft works to develop complete systems—and better performance per dollar—for the products it turns out in the service of its customers.

They're doing big things at

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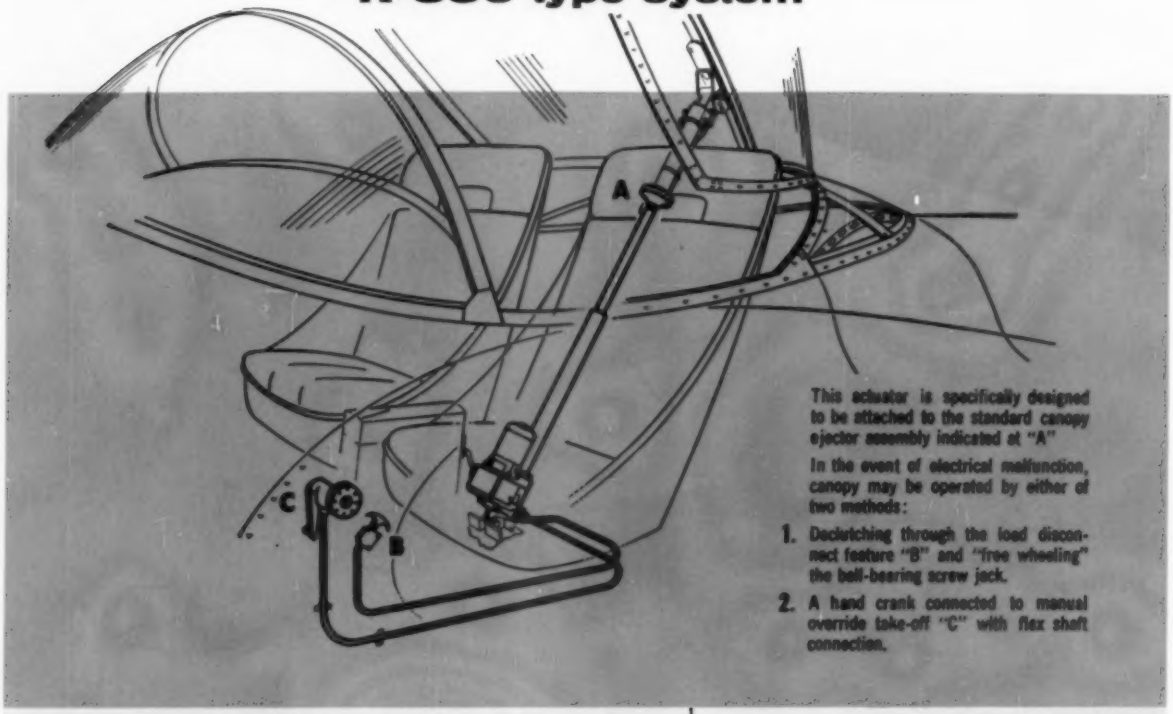
CANOPY OPERATING SYSTEMS

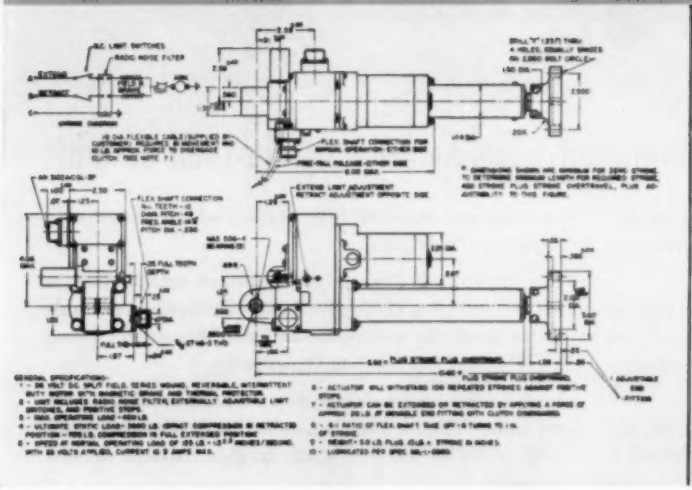
R-550 type system

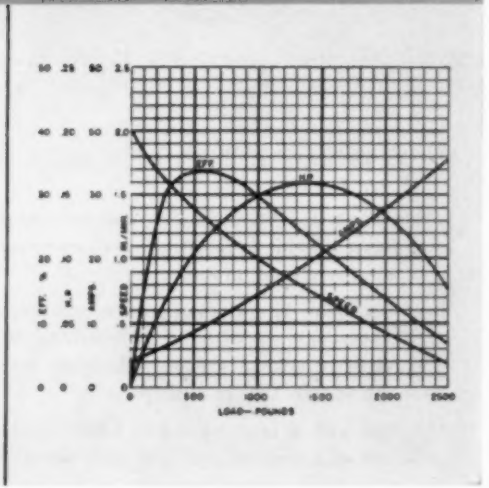


This actuator is specifically designed to be attached to the standard canopy ejector assembly indicated at "A"

In the event of electrical malfunction, canopy may be operated by either of two methods:

1. Declutching through the load disconnect feature "B" and "free wheeling" the ball-bearing screw jack.
2. A hand crank connected to manual override take-off "C" with flex shaft connection.





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AVIATION CALENDAR

Apr. 30-May 4—Society of Aeronautical Weight Engineers, 15th national conference, El Cortez Hotel, San Diego.

May 1-3—Annual Electronics Components Symposium, Dept. of Interior Auditorium, Wash., D. C., sponsored by American Institute of Electrical Engineers, Institute of Radio Engineers, Radio-Electronic-Television Manufacturers Assn. and West Coast Electronic Manufacturers Assn.

May 1-3—Mt. Washington Spring Planning Conference, sponsored by USAF and Navy, Eastern Slope Inn, North Conway, N. H.

May 1-3—Industrial Power Systems Institute, University of Wisconsin Extension Div., Madison 6, Wis.

May 2-3—Air Traffic Conference of the Air Transport Assn., spring meeting, Hotel Radisson, Minneapolis, Minn.

May 2-5—Twelfth Annual National Forum of the American Helicopter Society, Sheraton-Park Hotel, Wash., D. C.

May 4—Youth Aviation Forum, Florida Exchange Clubs, Dade County Auditorium, Coral Gables, Fla.

May 6-9—Second Annual Symposium on Flight Test Instrumentation, sponsored by Instrument Society of America, Bell Aircraft Corp., Convair and Temco Aircraft Corp., Hotel Texas, Fort Worth.

May 7-11—American Welding Society, annual spring meeting, Hotel Statler, Buffalo, N. Y.

May 13-23—Seventh All Woman's International Air Race, Hamilton, Ont., Canada to Havana, Cuba.

May 14-17—Design Engineering Conference of American Society of Mechanical Engineers, Convention Hall, Philadelphia.

May 16-18—Society for Experimental Stress Analysis, spring meeting, William Penn Hotel, Pittsburgh, Pa.

May 17-19—New York State Society of Professional Engineers, 30th Engineering Industries Exposition and annual convention, Statler Hotel, New York.

May 18—Armed Forces Day Dinner, Sheraton-Park Hotel, Wash., D. C.

May 21—Annual meeting of the Daniel Guggenheim Medal Board of Award, University Club, 1 W. 54 St., New York.

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Vol. 64, No. 18

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At Your Service... Hydrospin

A few of the typical shapes of metal parts which have been Hydrospun.

Take Advantage of This Power Spinning Process and Cut Your Manufacturing Costs

A Cincinnati Hydrospin machine is now in operation at Kaiser Metal Products, Inc., and is available to missile, jet engine and other manufacturers for development and production work.

Under high compressive forces, rollers form an inexpensive flat blank or simple preform to the shape of a rotating mandrel, usually completing a part in one pass. Movement of the roller brackets is controlled by hydraulic tracer and makes possible irregular wall thickness and curved wall shapes. Strength characteristics are improved and finish is excellent.

Savings Take Many Forms

Forming by this economical method obsoletes many chip cutting operations with resulting savings in labor, material and machines. One manufacturer has made savings of 100 lbs. of critical high temperature alloy in one jet engine part alone. Another development on a missile part shows savings of 40% in material over draw die method and saves weight of the finished part by control of wall thickness.

A wide range of metals has been successfully Hydrospun and, as the above photograph shows, an unlimited variety of tubular, conical and hemispherical shapes is possible. Ask us about ways to put this Hydrospin to work for you in solving your manufacturing problems on hard-to-make, highly stressed parts. We can show you how to produce a better part at a definite cost saving. Write for brochure today. Address Dept. A.

This Cincinnati Hydrospin, one of the few now in operation, may be the answer to your production problems.

Design Engineers: Take advantage of controlled wall thickness possible by this process and consider redesign for ultimate strength and weight savings.

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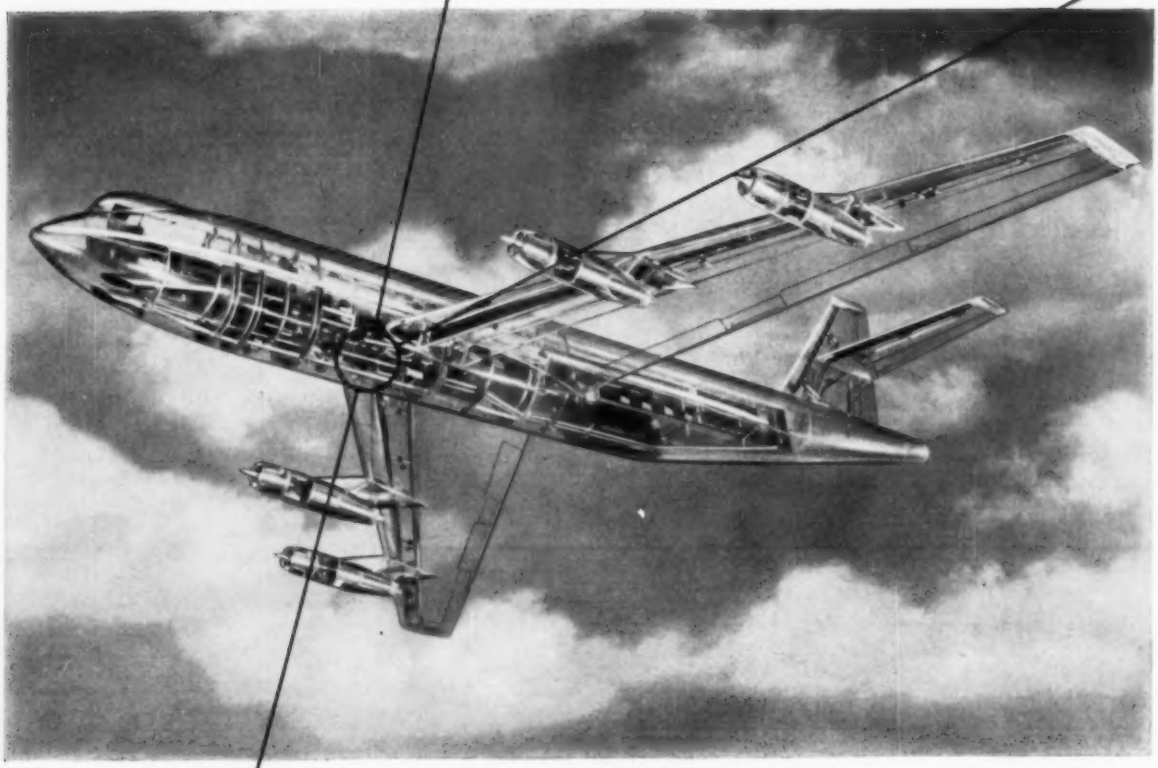

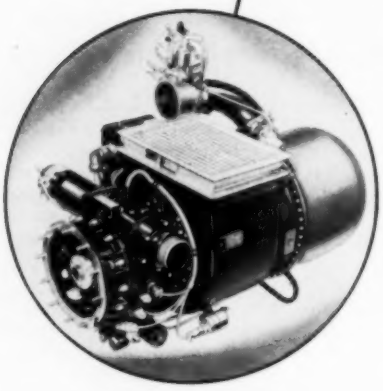

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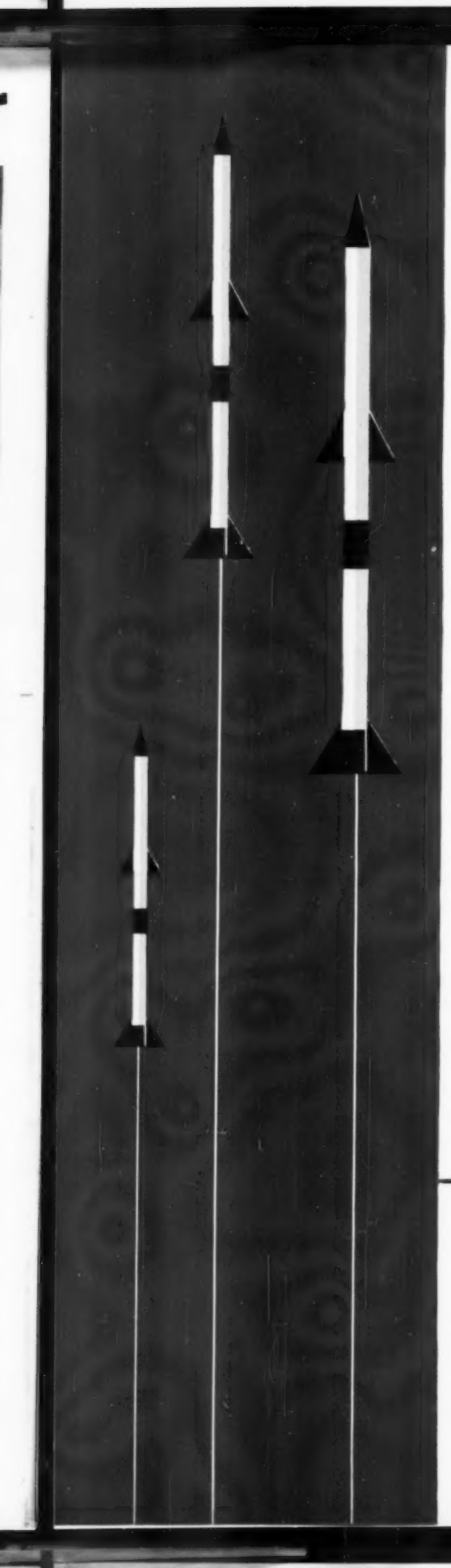

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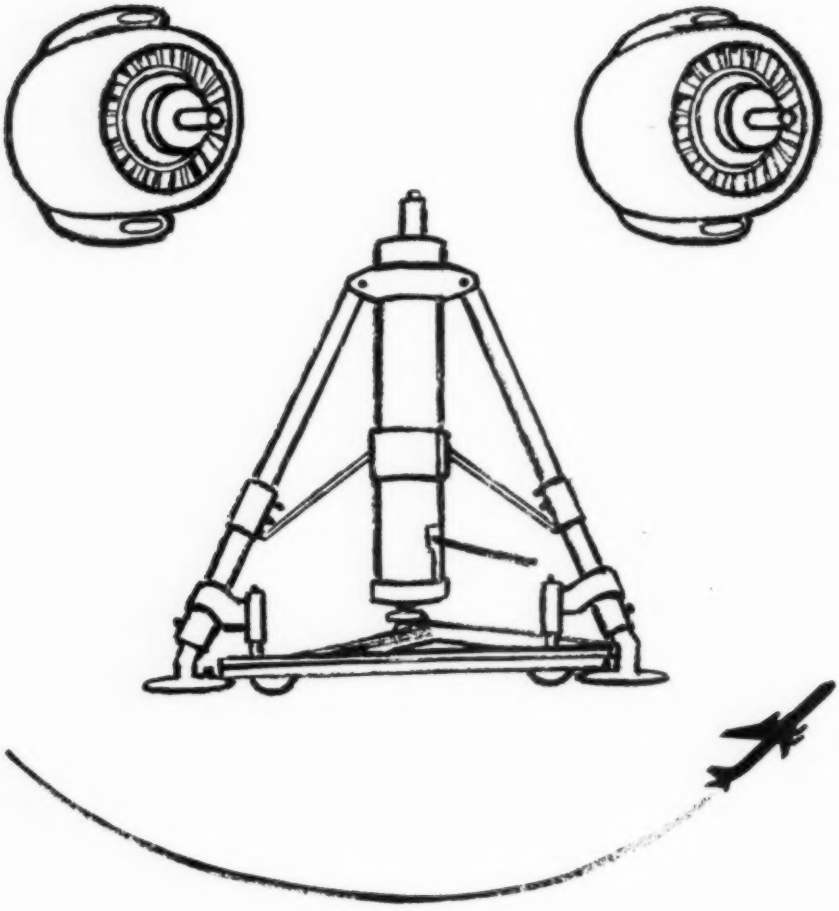

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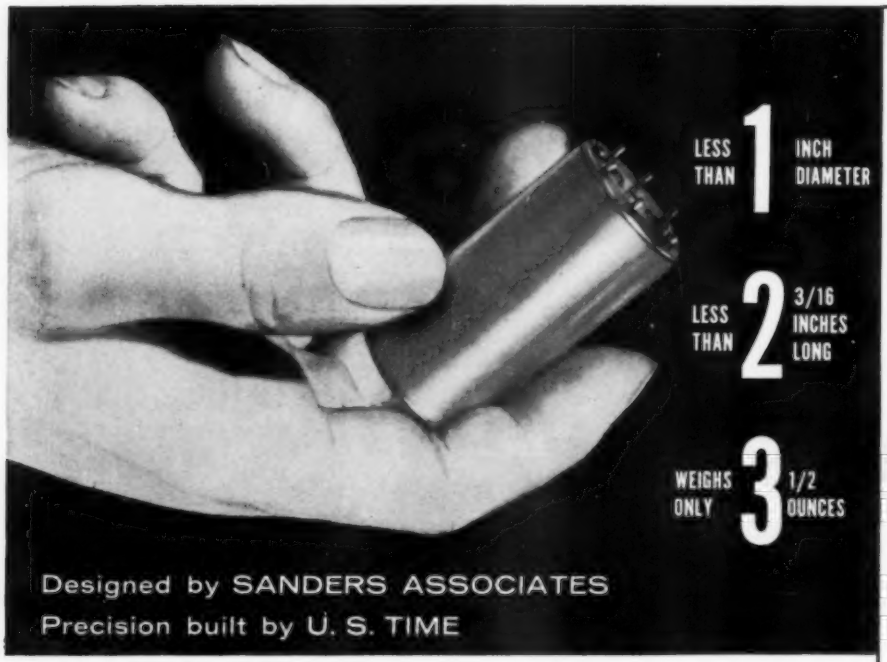
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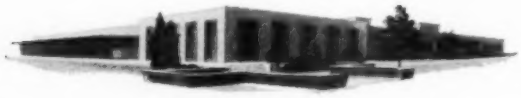

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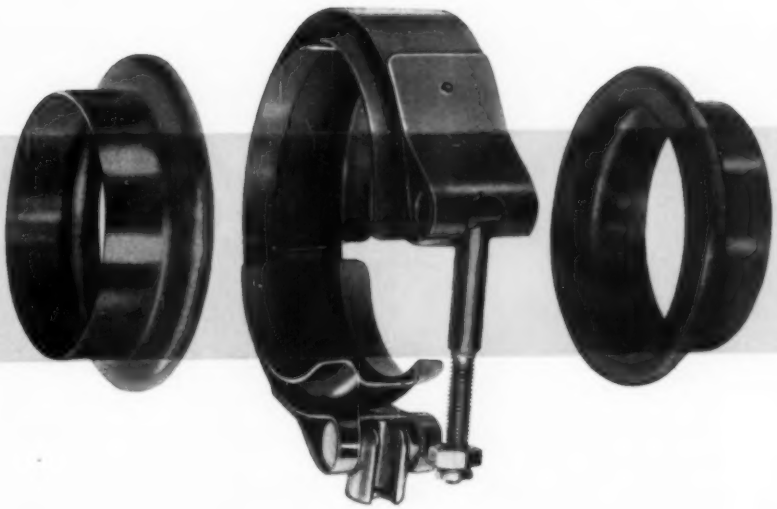

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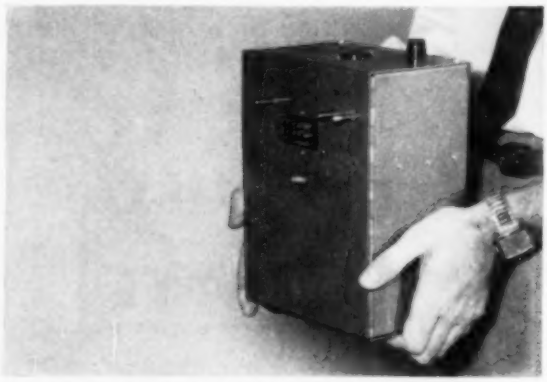

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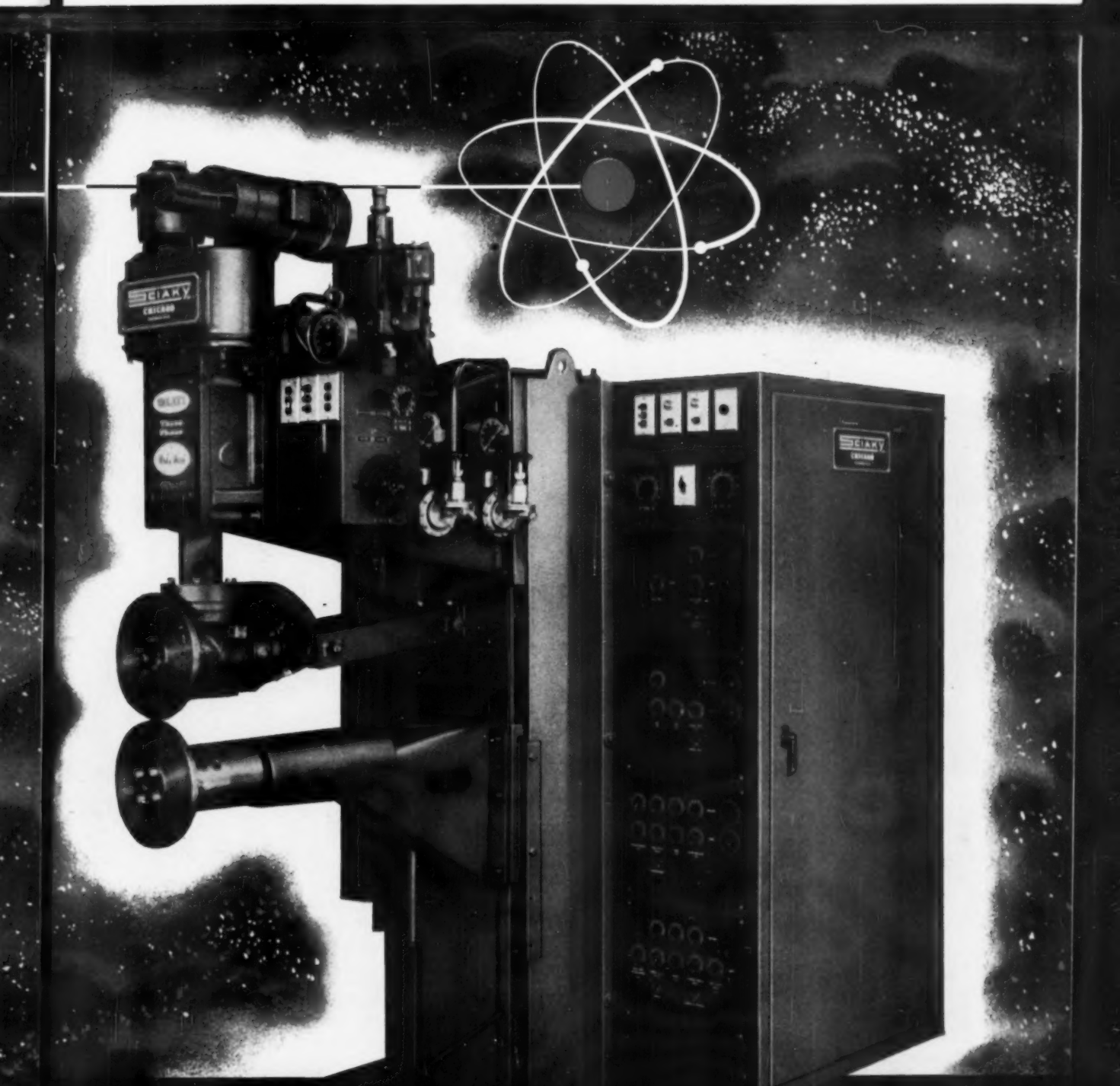

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APRIL 30, 1956

AVIATION WEEK

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COVER: Coast Guard P5M shepherds an airliner with one engine feathered on the final stage of a transocean flight. Coast Guard this week will distribute a new manual covering emergency procedures for aircraft on over water flights. Prepared with the assistance of the Navy and the Civil Aeronautics Administration, the manual is endorsed by all the services. For a full report, see p. 33.

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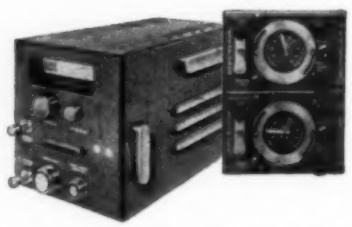

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LEAR *LEAR-ROMEC DIVISION: ABBE ROAD, ELYRIA, OHIO*

RO-20

EDITORIAL

Research Policy Needs Revision

President Eisenhower's $547 million supplementary budget request for more airpower indicates clearly that his original airpower budget submitted in January was inadequate. The character of the funds requested in the supplemental also indicates that the Defense Department and the White House do not yet understand the fundamental nature of the technological race with Russia for airpower supremacy and, consequently, have not yet acted to develop and support a sound aeronautical, military research program. The President has asked for $247 million more to increase production of the Boeing B-52 heavy jet bomber; $120 million more to extend the radar-warning net on both flanks of the North American continent and about $80 million more for missile research. These are all programs vital to our future airpower.

The only quarrel with this supplement might be that it is much too little much too late.

However, the most serious defect in the President's belated effort to bolster his airpower budget is the lack of any fundamental change in the funds for aeronautical research and development. The fundamental flaws in the aeronautical research policy as dictated by top-level Department of Defense officials and the White House in the face of almost-unanimous disapproval from civil and military experts in this field, may easily grow during the next few years until they undermine the entire structure of our military airpower. For research and development are the foundations on which the airpower of the future is always built. Without a sound research foundation, it is impossible to build superior airpower.

Principal Flaws

What are the principal flaws in our present aeronautical research-and-development policy? They occur in three broad areas—money, manpower and security.

Defense Secretary Wilson and his cohorts on the second floor E Ring of the Pentagon are proud of their "constant budget level" research and development policy that maintains this vital effort at about the same budgetary level year after year. They honestly believe this is a sound policy that will keep us ahead of the Russian technological surge. Nothing could be further from the truth. Nothing could indicate better their fundamental ignorance of the basic research and development problem.

Lt. Gen. Thomas Power, Chief of the Air Research and Development Command, sounded a clear warning on this problem before the Aviation Writers Association in Washington recently when he emphasized that the rapidly increasing rate of technical progress combined with increasing complexity of equipment required a constantly-increasing scale of research effort to achieve a constant level of progress. He said: "This means that one year's budget for research and development cannot buy an equal amount during the following years or thereafter. Therefore, research-and-development appropriations must be matched to the expanding requirements of technological progress.

"Unless we can see our way clear to do this we will lose our technological superiority to the less budget-hampered Russians."

The constant budget-level-research and development policy now pushed by the Defense Department and the White House will virtually guarantee our loss of technological supremacy to the Russians during the next five years unless it is drastically revised immediately.

Security Hobbles

In addition to the fundamental handicap of inadequate research funds, our scientific-engineering team is further hobbled by excessive and, for the most part, senseless military security restrictions. Scientific progress thrives and advances rapidly only in an atmosphere of fast and widespread interchange of information. The compartmentalized scientific effort that stems from the wartime Manhattan Project and the "need to know" policy of current military security is slowing the pace of American technological progress without hampering any competitor's progress. In addition, basically un-American policy and procedures in military security clearance operations has discouraged too many scientists from participating in the military research program. A recent survey of doctorate graduates in a leading technical university disclosed that more than half of them were not interested in participating in military research programs because of the star-chambered security procedures that can irrevocably blacken a scientist's character without a shred of legal evidence.

Testimony before the Moss Subcommittee in the House of Representatives disclosed that major universities such as Massachusetts Institute of Technology, Harvard, Syracuse and Chicago have refused government research contracts because of excessive security restrictions.

Excessive and blundering military security is restricting the free flow of vital technical information throughout the engineering, scientific, industry complex and is discouraging young scientists and engineers from entering the military research program.

This discouragement comes at a time when the scientific manpower being used in the military research program has reached a critical point. One Defense Department excuse for not increasing the research budget is that all the available scientific and engineering manpower is already being used in the military program, and more money would not solve this critical brainpower problem. This thesis quickly collapses on analyses which indicates that barely 10% of the scientific talent in this country is now being utilized on aeronautical and related research instead of the 50% that has been so glibly quoted in recent months.

The research-and-development problem is more complex and less easily dramatized than production of new weapons. But unless a few more millions are invested in a sound research and development program that will enable American science and industry to fully exploit the new technological frontiers that are now visible, all of the billions invested in production of aerial weapons will be wasted and we will face the future with second best airpower.

—Robert Hotz

FAFNIR BUILDS PLANT NO. 6

New five-acre plant at Newington, Connecticut will streamline machining and heat treating operations

Fafnir Plant No. 6, now nearing completion, will house the most modern machining and heat treating equipment and will provide for economical storage and handling of steel.

The opening of this large plant represents an increase in floor area of about 20% and an important step in a long-range program to speed production of over 10,000 types and sizes of Fafnir ball bearings and ball bearing units. The plant occupies one corner of a hundred-acre site which will make possible a four-fold expansion.

Fafnir's 18 strategically-located branch warehouses and its coast-to-coast network of authorized distributors will soon reflect the added productive capacity which these new facilities make possible.

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Most Complete Line in America

WHO'S WHERE

In the Front Office

Trevor Gardner, fromer Assistant Secretary of U. S. Air Force, has been named board chairman of Hycon Manufacturing Co., Pasadena, Calif.

T. A. Knowles, president, Goodyear Aircraft Corp., Akron, Ohio, succeeding **P. W. Litchfield**, who continues as board chairman and in an advisory capacity.

Richard Hodgson, executive vice president, Fairchild Camera & Instrument Corp., Syosset, N. Y., succeeding **John M. Case**, resigned.

Sidney E. Miller, vice president-general manager, Springfield (Mass.) Division, American Bosch Arma Corp., Garden City, N. Y. Also: **Harold R. Sennstrom**, vice president-engineering and **Kenneth F. Leaman**, vice president-manufacturing and assistant general manager.

William F. Hayes, managing director, Continental Motors of Canada, Ltd., St. Thomas, Ont., subsidiary of Continental Motors Corp., Muskegon, Mich.

Lee Renshaw, vice president, California Aviation Service, Inc., Oakland, Calif., Cessna distributor.

E. S. Jackson, Director-General, Atomic Weapons, British Ministry of Supply, succeeding **Lt. Gen. Sir Frederick Morgan**, Controller of Atomic Weapons.

Howard P. Hall, vice president-secretary and general counsel, Hughes Aircraft Co., Culver City, Calif. Also: **William W. Wooldridge**, vice president-administration; **John H. Richardson**, director-military sales and **Roy E. Wendahl**, manager of Tucson, Ariz., operations.

Honors and Elections

U. S. Air Force's **Air Defense Command** has been awarded the Daedalian Trophy for 1955, given the USAF command flying over 100,000 hr. annually that achieves the lowest adjusted aircraft accident in the preceding calendar year. Air Defense Command cut its major accident rate, all aircraft, by 52% and for jet fighter aircraft by 58%.

Capt. Edward V. Rickenbacker, board chairman, Eastern Air Lines, has been appointed to the National Advisory Committee for Aeronautics by President Eisenhower to fill the term of the late **Ralph Damon**.

Dr. Robert W. Bogle, senior research staff, Johns Hopkins University, Silver Spring, Md., has been named first recipient of a Johns Hopkins fellowship for professional staff members. He will do experimental research on "nuclear moments."

Changes

Donald K. Marsh, sales manager, Adel Precision Products, Division of General Metals Corp., Burbank, Calif.

Edmund V. Laitone, staff of Guided Missile Research Division, Ramo-Wooldridge Corp., Los Angeles, Calif.

Ernest W. Marchand, manufacturing director, Greer Hydraulics, Inc., Jamaica, N. Y.

(*Continued on page 102*)

INDUSTRY OBSERVER

► General Electric J79 engine which powers the production Lockheed F-104As is an all-steel design. Company experience with titanium and its alloys on J73, coupled with increased temperatures expected for J79, led to the decision.

► **DICBM (Detection of Intercontinental Ballistic Missiles) project prime contract has been awarded to Waltham Laboratories, Electronic Systems Division of Sylvania. Contract, monitored by Rome Air Development Center, will cover only the detection phase. Waltham Laboratories also has prime contract with Army Ordnance for development of complete anti-missile system, including the detection equipment and the weapons.**

► Four out of first 13 Convair B-58 Hustler weapons systems will have airborne electronic countermeasure equipment developed by Waltham Laboratories.

► **Designation for Boeing's nuclear-powered bomber, since abandoned in favor of the chemically fueled project 110, was project 125.**

► Another example of Russian retouching of American photographs was published in a recent Czech magazine. It purported to be a picture inside one of the latest Russian turbojet factories. Investigation showed the picture had been retouched from one appearing in a United Aircraft annual report. Major changes consisted of removing worker's neckties and replacing their white shirts with peasants' smocks.

► **North American's F-100F will be a two place version of supersonic day superiority fighter. Plane will have, as do other two-place versions of Century Series fighters, both combat and training potential.**

► Lear, Inc., has the contract for three-axis stability augmentation for Lockheed's F 104. Success of installation is apparent from pilots' comments that F-104 prototype has reached Mach 1.8 without any indication of stability problems, with and without external stores and armament.

► **The aerial photo reconnaissance system of the Convair supersonic RB-58 Hustler incorporates a closed circuit television view finder and a fully automatic control system for pulse and image motion control cameras (AW Nov. 21, p. 34). Fairchild Camera and Instrument Corp., subcontractor, has reduced the original weight of 1,584 lb. for entire system to 795 lb.**

► Vertol Corp. will receive a Office of Naval Research contract to develop a VTOL project for the U. S. Army.

► **USAF's Air Materiel Command has awarded contracts totaling $3,342,200 to five firms for "facilities in support of" Convair's Atlas intercontinental ballistic missile. The firms and the dollar amounts: Sperry Rand, $155,400; Avco Manufacturing Corp., $1,425,000; Burroughs Corp., $400,000; Western Electric, $500,000; General Electric, $861,800.**

► North American Aviation, Inc., has received an additional $5,325,000 contract award from the Air Materiel Command for further development of its Navaho intercontinental missile.

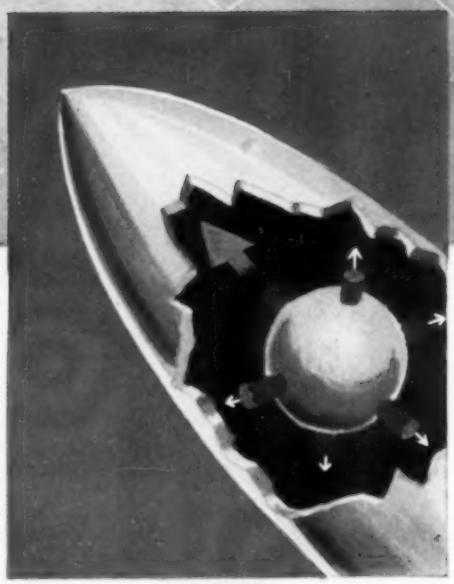
► **USAF's Cambridge (Mass.) Research Center has initiated a research program to study means for the suppression of contrails on high-altitude missions over enemy territory.**

► Rome Air Development Center has developed a new optical plotting device known as "MINK" to speed the display and identification of radar-detected aircraft. Radar blips appearing on a cathode ray tube are optically transferred onto a 16-inch plotting surface which, in turn, is projected optically onto a large screen where it can be viewed by a number of persons.

FAIRCHILD GUIDED MISSILES DIVISION PIONEERS

the application of

INERTIAL NAVIGATION



After years of experience in the application of inertial navigation, Fairchild Guided Missiles Division is now participating in the development of many new systems of this type.

The particular direction being taken by our talented engineering and scientific staff is of course secret, but the importance of inertial guidance to America's defense is not. The missile that incorporates true inertial guidance is virtually non-deterrable, because it is totally self-contained, depending only upon its own "brains" to pinpoint its target.

Developing such projects as these demands the greatest knowledge, experience and inventiveness. You'll find them all at Fairchild Guided Missiles Division, currently being applied as well to many other new, advanced concepts in this vital field of defense.

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...WHERE THE FUTURE IS MEASURED IN LIGHT-YEARS!

Washington Roundup

Fare Review Coming

Prospects for an investigation of domestic passenger fares by the Civil Aeronautics Board grow brighter as the tide of congressional pressure for an investigation rises. The latest prodding came from the House Appropriations Commerce Subcommittee which reviewed the CAB budget. Committee members suggested that Congress might direct the Board to launch an investigation if it didn't go ahead on its own.

A key factor in congressional discontent is the fact that the CAB hasn't set a standard rate of return and other orthodox regulatory yardsticks in a specific policy applying to passenger fare levels. Congressmen agitating for an investigation want the Board to apply utility regulating techniques used in other fields to the airlines.

The pressure from the House subcommittee came on the heels of a Government Accounting Office recommendation that the Board investigate passenger fares. Earlier, Rep. Emanuel Celler (D.-N.Y.), chairman of the House Anti-Monopoly Subcommittee, criticized the CAB for never having conducted such an investigation. All this agitation makes it more and more difficult for the CAB to avoid a general fare investigation.

Renegotiation Renewal

Lack of time and the strong opposition of small businesses indicate that the Renegotiation Act—due to expire Dec. 31—will not be renewed by Congress before adjournment for the political conventions. The Joint Congressional Revenue Committee is now making a study to determine whether or not it should be.

Aircraft Industries Assn., in its report to the committee, takes the position that the act is "unnecessary." But, if it is renewed, AIA emphasized, the policy should be clear that "a primary concern of the government is to encourage the attainment of a strong, stable defense industry with proper incentives to insure progress and efficiency . . . the Renegotiation Board should give due weight to the importance to the defense program of permitting and encouraging the defense industry to go forward with the research and development and facilities replacement and expansion programs which are essential for the defense job . . ."

National Security Industrial Assn. has taken a similar position: "There is a real question whether over-all profit control is required at all in any area in our present peacetime economy. But, whatever may be the answer to that question, it is clear that a profit control law like the present Renegotiation Act, which ignores traditional concepts of fair dealing and due process, cannot be justified on any basis. It should be repealed."

IATA Fare Plan

A third-class transatlantic service may be offered to the International Air Transport Assn. by the U. S. airlines as a solution for the IATA fare problem. IATA will hold a traffic conference meeting at Cannes, France, at the end of May to try to find solutions to the problems raised by the Civil Aeronautics Board when it sharply criticized IATA fares, especially for tourist service, and refused to approve the fares past September 30.

Pan American World Airways is reported working on a plan for a service with higher density seating than current tourist service, no free meals and fares about 25% lower than regular tourist fares. The service would be more like domestic aircoach service than current overseas tourist service and would leave the Atlantic air traveler with a choice of three classes of service.

The foreign airlines aren't likely to think much of such a plan. Scandinavian Airlines System, for instance, favors an excursion fare with a 17-23-day time limit and a 30% fare reduction. SAS figures such a solution would tap new markets and smooth out directional traffic imbalances.

Minetti Action

Over the protest of Sen. Mike Monroney (D.-Okla.), chairman of the Aviation Subcommittee, Senate Commerce Committee has scheduled a hearing May 10 on the nominations of G. Joseph Minetti to the Civil Aeronautics Board and Charles J. Lowen as administrator of the Civil Aeronautics Administration. Monroney wanted action on his legislation separating Civil Aeronautics Administration from Commerce Department before consideration of the nominations of either Minetti or Lowen—both submitted Jan. 9. Monroney reported that hearings on the independent CAA bill will not be completed within two weeks. He launched the legislation after the firing of former CAA Administrator Fred B. Lee.

Job Description

The long-uncertain role of the Assistant Secretary of Defense for Applications Engineering still is being shaped three years after the job was created. The office, held by Frank D. Newbury, retired vice-president of Westinghouse Electric Corp., now has a mission "to guide the military services in the management and accomplishment of their initial provisioning responsibilities."

New Defense Department Instruction (No. 3232.4, April 2, 1956) says objective is "to assure that initial spares and repair parts (including special tools, test equipment and support equipment) required to support and maintain end items of materiel being introduced into service will be available . . ." Army, Navy and Air Force are given 60 days to review spares programs and take action, 120 to tell Newbury what new regulations they have instituted.

Bilateral Air Agreements

Legislation making airline industry participation mandatory in negotiations for all international bilateral air agreements can be expected at this session of Congress. Senate Commerce Committee has decided unanimously to push it. The move was touched off by the U.S.-German bilateral. After hearings and investigation, a subcommittee, headed by Sen. George Smathers (D.-Fla.), issued a report declaring that "many of the inadequacies" of the agreement, resulted from "failure of the government to confer with and to allow sufficient participation by representatives of the airline industry. It is important that our government avail itself of the expert assistance within the air transport industry."

—Washington staff

CAA Outlines Jet Traffic-Control Plan

Five-year plan to modernize air-traffic-control system described in testimony at budget hearing.

By Cecil Brownlow

Washington—The Civil Aeronautics Administration's proposal for a five-year plan to modernize the nation's air-traffic-control system and meet the needs of the military/civil jet age were revealed last week by the House Appropriations Commerce Subcommittee with the release of testimony given in support of the CAA's Fiscal 1957 budget requests.

The testimony, presented by leading Commerce Department and CAA officials, also outlined plans for an intermediate air-safety program that will extend traffic-control above the 24,000-ft. level and serve as a stop gap until the five-year plan is implemented.

The officials, including Louis S. Rothschild, Undersecretary for Transportation, and CAA Administrator Charles J. Lowen, also indicated that the Administration has reversed its stand on the prospects of DME as a navigation measuring device and now leans towards some form of Tacan as the eventual answer. They asked for no funds for additional DME installations, and Rothschild stated flatly at one point that "VOR-DME is not good enough to meet the tactical requirements of the military, period."

At another point, Col. J. F. Taylor, director of the Air Navigation Development Board, said the decision on a common-navigation system would involve a "change" in the Tacan configuration, "which is presently being considered," or further development of any other "system which is chosen for common-system use."

Five-Year Plan

Lowen told the subcommittee that the additional $40 million requested by the CAA in its record $202,618,000 budget (AW Jan. 23, p. 27) will go towards the establishment of additional air navigation facilities to serve as the backbone of the five-year plan.

The CAA administrator estimated that capital investment for the three-phase plan—a "complete" navigation system, more radar and expanded communications—would be "roughly" $245 million and said operating costs would run approximately $146 million annually.

Backed by strong endorsements from both the USAF and the Navy, Lowen said the CAA has three primary requirements:

- **More trained manpower** to man the new facilities.
- **Positive control** of aircraft flying at altitudes of 24,000 ft. and above.
- **"Best possible" radars,** navigation aids and communication facilities.

As one means of obtaining new navigation facilities at the lowest possible cost, Lowen said the CAA will "fully explore" possible use of the military's air-defense SAGE (semi-automatic ground environment) radar network in traffic-control operations. He said, however, that "Its adaptability to handle not only military missions for interception purposes but also a great volume of mixed types of aircraft is yet unproven."

New Facilities

Joseph H. Tippets, director of the Office of Federal Airways, later detailed for the House subcommittee CAA plans for new facilities during Fiscal 1957. They include:

- **Twelve route** traffic-control towers.
- **Two approach light systems.**
- **Ten landing systems.**
- **Nine airport surveillance radars.**
- **Forty-five repeaters** for existing and new radars.
- **Twelve precision** approach radars.

Tippets said that during the five-year program, the CAA plans to cover the United States "15,000 ft. and above with a radar blanket, and down lower on the conventional airways through all of the instrument altitudes."

The 1957 appropriation request, he said, will provide for such radar coverage in the New York, Chicago, and Washington areas, and along a "rather small section" of the Pacific Coast.

Over the same five-year period, Tippets said, the CAA's radio-navigation system must be expanded to provide coverage down to 700 ft. along the controlled airways and "blanket coverage at 15,000 ft. and above throughout the United States."

Communications Need

"We have," he told the subcommittee, "these three primary elements—communications, radar and radio navigation. Adequate control depends on constant knowledge in the control room of where these aircraft are; the pilot having constant knowledge in the cockpit as to his distance and direction from any particular location along any given route and an equal, if not more important, constant communication between the pilot and the controller to maintain improved separation standards."

Tippets said the increased use of long-range radar will enable the CAA to increase the instrument capacity of its system by "at least four to one."

"Today at 300 mph.," he explained, "we can only get two airplanes in (a) block of 100 miles of airspace. By the use of radar traffic control, we will be able to put four airplanes with a speed of 300 mph. in that same air space."

Earlier, Tippets described the present air-traffic-control system as one "designed and actually installed for aircraft in use years ago, when we had the DC-3 class of equipment," and Lowen testified that:

- **"Strategic Air Command** is unable to perform its operational missions on schedule due to traffic control. . . ."
- **"Air Defense Command** reports that the inability of the CAA to clear their aircraft on instrument flights is interfering substantially with the performance of their missions. . . ."
- **"Tactical Air Command** reports the same thing. . . ."
- **"Air Training Command** reports that air-traffic-control limitations are substantially reducing its effectiveness. . . ."
- **"Air Transport Association** advises that air-traffic-control limitations, flight cancellations or delays in flights resulting from air-traffic-control congestion, are resulting in its now losing revenues aggregating some $9,400,000 annually.

Lowen then warned that: "Unless major improvements are made in air-traffic control, the current rate of limitations placed on air traffic are estimated to cost the air carriers in 1965 revenue losses annually aggregating $22 million.

"In summary, under the existing limited air-traffic-control system for the

CAA Authority Delegation

Washington—Charles J. Lowen, administrator of the Civil Aeronautics Administration since last December, may direct the CAA to resume responsibility for some of its powers now delegated to the airlines and industry.

Before the House Appropriations Commerce Subcommittee Lowen declared:

"I am taking a look at this delegation of authority. I feel that in many instances we have delegated, too much and too far, the heritage of the CAA. So we are in a process through my various program offices, Aviation Safety, Federal Airways and Airports, of taking a look to see that we have not delegated responsibility too far in some of these instances, pulling back and taking the responsibility of doing the job."

C-133A Makes First Flight

Douglas' C-133A turboprop transport made its first flight last week—a 100 min. trial that included primary stability and control analysis. Plane took off at 165,000 lb. gross weight (design gross is 255,000 lb). Buffet warning was ample and the C-133 broke clean from a complete power off stall. Yaw stability was good. An expected downward pitching moment in full power applications at low air speeds failed to materialize, test pilot J. C. Armstrong said. High wing and thrust line above fuselage center of gravity had raised question about creation of a high moment, but Pratt & Whitney, T-34 engines accelerated the aircraft too fast for moment to develop.

period 1955 through 1965, the loss in revenues by the scheduled air carriers due to traffic-control limitations would aggregate $150 million."

24,000-ft. Plan

As a partial, interim solution, Lowen detailed plans to establish radio control of all airspace above 24,000 ft. in order to provide greater safety for high-speed, fast-closing military jets (50% of the total U. S. flying hours are now accumulated by the USAF) and to have a firm plan in operation for the advent of civil jet airliners.

The plan, at an estimated cost of $1,046,640, calls for the establishment of 39 operational control points and a total of 330 operating positions requiring new communications lines, new terminal equipment and the re-arrangement of existing center terminal communications' equipment.

Such control, Lowen testified, will ease the military problems, alleviating the "no-longer-safe" see-and-be-seen basis, and simplify the CAA's task of getting the high-speed, high-altitude aircraft up and down through the lower-altitude space now serving civilian traffic "without danger to either the civil or military craft."

Lowen emphasized, however, that final, "positive" control under all-weather conditions "requires the use of radar and direct communications."

Below 24,000 ft., CAA control still will be exercised only over the established airways.

In detailing specific CAA problems, as related to the increased workload, Tippets cited the following figures:

- **"In 1950 through 1957,** we will have experienced in fix postings (the number of times an aircraft makes a position report) an increase of 159%. . . ."
- **"In the area** of instrument approaches . . . up through 1957 we will have an increase of 195%. . . ."
- **"In aircraft operations,** . . . we will have an increase of 38% and a steady rise . . . of 15% or more annually."

Lowen and other staff members also revealed that a total of $20 million had been shaved from the original CAA budget requests for Fiscal 1957 as they passed through the Bureau of the Budget for final administrative approval.

The original requests, they said, asked for $132,980,000 for operation and regulation; the Bureau of the Budget approved $128,500,000.

The establishment of air-navigation facilities was set at $54,946,750 by the CAA, shaved to $40 million by the Bureau of the Budget. Still another Bureau cut was made in requests for maintenance-and-operations funds for Washington National Airport.

VOR/DME-Tacan Controversy

Lowen, said, however, that the approximately $15 million taken from the requests for air-navigation facilities would not "effect the overall total amount of the five-year plan. . . . As we don't get the $15 million; it will be in next year's request."

The CAA members came in for their roughest going over during testimony and subsequent questioning regarding the status of VOR/DME vs. Tacan.

The questioning was touched off when the CAA requested funds for the operation of 241 already-installed DME units, which initially cost about $10 million, but made no requests for additional installations.

Rothschild testified that only 344 aircraft have been equipped with the necessary equipment to make use of DME and, under questioning, added that the VOR/DME controversy was still unresolved despite his statement of last year which said in part:

"I am happy to report to you that the Air Coordinating Committee . . . agreed unanimously that VOR and DME are still the nationally and internationally-approved distance-navigation equipment for common-system use. . . ."

While holding out hope for Tacan, Rothschild compared its state of development with that of the radio when "you used to buy the components and put them together at home. . . ."

It was after this that he made his statement that VOR/DME is not "good enough" for the military, "period."

Taylor testified in behalf of the $2 million the Air Navigation Development Board wants from the CAA to help support its programs for:

- **Development** of a rotary-wing navigation system. New York Airways will test and evaluate the system.
- **Decision** on a common-navigation system.
- **Evaluation** of air-traffic-control methods and procedures.
- **Evaluation** of common and civil-military radar beacon.

Cutback in MATS Traffic Urged To Help Reduce Airline Subsidies

By Katherine Johnsen

Washington—Pressure to cut back the operations of Military Air Transport Service and shift passenger and cargo business to commercial airlines is gaining force in the House Appropriations Committee.

At hearings on the Fiscal 1957 Budget for the Civil Aeronautics Board, Rep. Daniel Flood (D.-Pa.) declared: "What I am trying to do is to cut some of this business out of the Defense Department for MATS and if the commercial people can come in and take that, then I can cut out subsidy for commercial airlines."

MATS, Flood said, "has become sort of a Gargantua. They are spending a billion dollars in that operation, and since this committee has seen fit to try and remove these airline subsidies as much as they reasonably can, I want to try to find out what subsidy we are trying to build up—MATS, the commercial airlines, or what. I guess they both need some kind of help, but I want to see how far we should go."

The General Accounting Office has already urged Congress "to recommend that the Department of Defense transfer, wherever possible, all traffic from MATS to commercial airlines, (1) to achieve a significant reduction in subsidies, and (2) to increase the reservoir of civil aircraft."

Former CAB Chairman Ross Rizley, in his final congressional testimony before becoming a federal judge, told the appropriations group that the board agrees "100%" with the GAO position.

Committee members, strongly favoring a prompt CAB investigation looking to reductions in airline passenger fares, disclosed that they are considering legislation directing it and an appropriation to provide for it.

CAB Member Chan Gurney said that "I am sure that the Board will consider carefully" the matter of the investigation "as soon as we get our new Board together." Gurney declined to commit himself, but CAB Member Joseph Adams repeated his position that the investigation should be undertaken.

Rep. Albert Thomas (D.-Tex.) suggested to Gurney, "suppose we help you make up your mind and write something in this bill. You ought to have made the investigation three or four years ago, in my judgment."

Thomas feels the CAB should be required to keep records of airline representatives who contact Board members and employes and should submit the data annually to the Appropriations Committee.

"I presume every carrier has at least a half dozen employes whose job it is to impress upon CAB and its employes that their subsidy check is far too small and that their rates are such that they are constantly losing money and therefore ought to be increased," Thomas commented. Irving Roth, Chief of CAB's Rates Division, said, "I would not take issue with that."

Rizley commented that Thomas' proposal that lists of representatives contacting the Board be furnished Congress "is not a bad suggestion."

Congressmen were critical that subsidy payments for Fiscal 1957 operations will amount to an estimated $46.5 million, compared with $43.2 million for Fiscal 1956. CAB explained that the Fiscal 1956 figure reflects about $3 million of a $7 million reduction in subsidy to Pan American World Airways because of capital gains realized by the carrier from equipment sales, and reported that actually the Fiscal 1956 and Fiscal 1957 payments are "at the same level." Rizley estimated that "the time is not too far off" when international carriers will be off subsidy, but that "it is quite some time in the distance before we can hope all local service carriers will be."

One factor in subsidies to the local lines, Rizley said, is that "there has been a substantial expansion and one of the reasons, believe it or not, has been due to members of Congress." He added that there has not been any "undue pressure" for local line expansions from members of Congress.

Reds Brag About Hydrogen Missile

London—Russia is developing an intercontinental missile with hydrogen warhead, Nikita Khrushchev, Soviet Communist leader, warned the West last week.

In a blunt speech which appeared to anger rather than intimidate his British hosts (Khrushchev with Premier Nikolai Bulganin is on an official visit to Great Britain), he said, "I am quite sure that we will have a guided missile with hydrogen bomb warhead that can fall anywhere in the world . . . so you think we are behind you?"

Khrushchev was arguing that strategic export restrictions are not preventing Russian advances in armaments.

The Russian visitors also revealed that A. N. Tupolev was building a turboprop airliner of much larger size than the Bristol Britannia, Britain's leading new transport. After inspecting the Britannia, Tupolev, also visiting England, said the new Russian plane was "something bigger which could be flying in the spring of next year. It is a four-engined turboprop machine which will carry 150 people."

Somewhat later, at Birmingham, Khrushchev referred to a 170 passenger airliner which Tupolev was building.

"You must not think we are behind you in the production of aircraft," Khrushchev said, "the British authorities were kind enough to show us one of your latest aircraft, a very fine aircraft. But we have here among us our well known designer Tupolev who is now building an aircraft for 170 passengers."

Russia's final demonstration of the week was to fly three Tupolev 104 jet airliners to London. The Tu-104 is a twin-jet aircraft (AW Apr. 2, p. 28; Apr. 16, p. 46, 126).

Washington Reaction

Washington—Nikita Khrushchev's announcement that Russia will soon have guided missiles with hydrogen bomb warheads "which can hit every point in the world" was generally accepted at its face value by U. S. military and diplomatic officials and comments included:

- **President Eisenhower said he had no reason to challenge the forecast but added there is a long distance between laboratory capability and the construction of an expensive, effective and elaborate instrument of war.**
- **Sen. Stuart Symington (D.-Mo.) expressed belief in the statement and said he was "glad to hear" the President is not "underestimating" the Russian threat.**
- **Secretary of the Air Force Donald Quarles said he saw no reason to "assume that (Khrushchev) didn't know what he was talking about. He repeated his conviction, however, that "manned bombers clearly will be the preferred means of delivery (of nuclear weapons) for the next five years and that they undoubtedly will be important for the next ten years."**
- **Sen. Henry Jackson (D.-Wash.) said "the timing and setting of Khrushchev's statement give it the setting of blackmail—Britain is vulnerable to long-range missiles."**

House Group May Propose End to OSI

By Evert Clark

Washington—The short, unhappy life of the Commerce Department's highly controversial Office of Strategic Information may soon come to an end.

Sources close to the House Information Subcommittee indicated last week that a final report on a year-long study of government information policies will strongly recommend that OSI be abolished.

Commerce sources, in turn, reported that many department officials would be happy to see OSI go.

Using an AVIATION WEEK article as the basis for much of their questioning, subcommittee members quizzed OSI Director Erwin Seago closely for three hours at a public hearing.

Both Democratic and Republican members said they were "amazed," "puzzled" and "confused" by OSI's operations.

OSI was created Nov. 1, 1954, by a Commerce Department Order issued pursuant to a National Security Council Directive.

OSI's purpose, according to the order, is "to coordinate the release of unclassified scientific, technical, industrial and economic information, the indiscriminate distribution of which may be inimical to the defense interests of the United States."

Although its functions are limited solely to advising government, science and industry on the release and distribution of unclassified information, questioning of Seago disclosed that:

- **The NSC directive** is classified. Seago refused to discuss it for that reason.
- **Seago,** as director of OSI, has a "top secret" clearance.
- **OSI's semi-annual** progress report is classified "confidential."

What Kind of Animal?

Subcommittee Chairman John E. Moss (D.-Calif.) said he frankly could not understand "what kind of animal we have here." He directed Seago to let a subcommittee staff member, properly cleared for access to "confidential" data, read the progress report. He added that he was "strongly of the opinion that this is an abuse of the privilege of classification." Other comments:

- **Rep. George Meader (R.-Mich.):** "It seems probable that the whole value (of OSI) is to give government agencies something they want, something to hide behind when they don't want to give out information. You can't compel action, but you can provide a cloak under which they can conceal things."
- **Rep. Dante B. Fascell (D.-Fla.):** "I think you ought to send back that classified directive you got from NSC because you say you're not supposed to have anything to do with anything classified . . . At this point I see no use whatsoever for OSI, the (Commerce) order, the NSC directive or the whole business."

OSI 'A Little Congress'

Seago testified that OSI is not a censorship agency, has no power to compel a government agency to withhold non-classified but "strategic" information and is not an "operating agency." He said it is an agency "to furnish studies and guides in this field of strategic information."

"You are just a little Congress down there, passing laws, making policies—and you say you are not an operating agency," Rep. Meader said.

The order from Commerce Secretary Sinclair Weeks creating OSI re-delegates to OSI's director "the authority vested in the Secretary of Commerce by the National Security Council."

Seago disagreed with subcommittee counsel John J. Mitchell's suggestion that the "mere fear of an NSC directive" causes government employes to withhold information any time OSI suggests it.

As an example, Mitchell referred to an AVIATION WEEK report (Jan. 30, p. 25) on the growing dissatisfaction among military security officers over OSI's power in the censorship field. The report reflected one security officer's doubt as to whether OSI recommendations carried with them the authority of the NSC. It also told how OSI rejected as too "strategic" certain unclassified aerial photographs which the Pentagon had selected for use in an exhibit publicizing President Eisenhower's "Open Skies" inspection plan.

Seago's Stand

Seago denied "overruling" the Pentagon on the photos and said the report was "a garbled account." He admitted his office had "advised on the matter and suggested the need to take a second look at the aerial photographs." He also said fewer unclassified aerial photos are being published by government now that his office has advised other agencies on policy.

Rep. Meader asked Seago to give the subcommittee "a full history" of the Open Skies incident, including any written documents.

"We want," he said, "a detailed account of a specific instance rather than reams of generalities."

(In a speech before the American Chemical Society at the University of Minnesota last Sept. 15, Seago said: "It has been determined that all aerial photographs are strategic in that they give target information or navigational information for the guidance of planes or missiles to targets. At the same time, aerial photographs are necessary for the technological and economic development of our country. These findings have resulted from a study out of which a policy for the executive branch of government will be established in regard to the use of aerial photographs. This study and proposed policy has been developed in cooperation with the aerial photographic industry of the country. Industry is planning to follow the same procedure as that being developed for use by the government which provides for the stamping of aerial photographs to indicate that they have strategic value.")

OSI transmits its "advice and guidance" to other agencies, Seago said, primarily through monthly meetings of its Interdepartmental Advisory Committee on Publication. Members include Agriculture, Commerce, Defense, Interior, Justice and Health, Education and Welfare Departments; the Atomic Energy Commission, the National Science Foundation, the State Department and "other intelligence agencies."

Seago gave these examples of what agencies have done or could do with

Erwin Seago

Erwin Seago, 53, director of the Office of Strategic Information, is on leave from the University of Virginia Law School where he has been a lecturer on aviation law since 1952. Previously, he had practiced law in Chicago for 25 years.

Seago is a member of the Editorial Advisory Board of the Journal of Air Law and Commerce and a former member and chairman of both the Chicago Bar Association's Aviation Committee and the Chicago Association of Commerce and Industry's Aviation Committee.

In 1944, he was adviser to the Ethiopian delegation to the Chicago International Civil Aviation Conference. From 1946 to 1952, he was Chicago counsel for Pan American Airways. In 1946, he was spokesman for the scheduled airlines before the Illinois Legislature to prevent the passage of state regulatory legislation. The airlines were successful. Seago has served as corporation counsel for two Chicago suburbs, redrafting the general municipal code for each. He now lives in Dillwyn, Va.

the help of OSI's advice to safeguard unclassified information, "the indiscriminate distribution of which may be inimical to the defense interests of the United States:"

• **"Eliminating overly specific** descriptions and quantities on awards and procurement offers concerning new weapons and special installations" from the Commerce Department's daily synopsis of proposed procurement, sales and contract awards.

• **"The first public indication** of a classified radar project on our Southwest borders was revealed through a government publication where bids were solicited for construction of an 'aircraft early warning station.' If words such as 'special installation' had been substituted for the words 'aircraft early warning station' harmful information would not have been divulged. This emphasizes the type of thing with which we are concerned in government publication. This is not censorship or suppression of news. It is just common sense."

• **"It is hoped to accomplish** uniformity in government as to publication and release for publication of aerial photographs by indicating the Defense Department as the central place where all government aerial photographs (not just Defense Department photographs) are to be reviewed prior to such publication."

Contradictory Assignment?

Subcommittee members expressed considerable confusion over OSI's apparently contradictory assignments:

• **"Increase the flow** and interchange of (technical) information with the Soviet bloc for a more advantageous return to our country."

• **Guide and advise** government agencies to guard against publication of information "which might be prejudicial to the defense interests" and to "provide a central clearing house to which science, business and industry may look for guidance, on a voluntary basis, in considering the public release of nonclassified information which might be prejudicial" to defense interests. In connection with these two functions, Seago said: "Too much of our technical industrial, scientific and economic information is going to the Soviet bloc. This is a problem which requires the attention of the entire nation."

OSI operates on a $60,000 annual budget. In addition to Seago and an assistant director, there are three staff assistants, described as "mostly clerical." A unit at the Library of Congress makes up "want lists" of Soviet publications for OSI to circulate but Commerce pays for this on contract.

Seago said his office had made no attempt to determine what other agencies do in the way of reviewing information before they release it.

Chairman Moss said he saw "little net result for 18 months' of time and money." Subcommittee members said OSI's accomplishments so far seemed to duplicate work done by the National Science Foundation, the Bureau of Foreign Commerce (export control of technical data) and the subcommittee itself.

When subcommittee members pressed him for examples of what this country had obtained as a result of OSI's efforts in technical exchange, Seago could give only three examples, although he said there "could be a good many" more in his files:

• **Some labor statistics.** Seago said he did not know how valuable they were and had no word about their value from the agency which obtained them.

• **Some Soviet medical films.** The State Department obtained the films from the Soviet Embassy in Washington six months after it asked for them. Although Rep. Meader said it sounded to him "like something State took up with the Soviet Embassy," Seago insisted his office "coordinated the entire project."

• **A journal** published in Budapest. Seago read the letters of the title, but said he could not translate the title and did not know what the journal was about. Rep. Moss referred to the journal thereafter as "this alphabetical menagerie," and Rep. Meader said he was "surprised" that Seago could recall no examples other than the labor statistics, the Soviet films and "this long name that nobody knows what it is."

The subcommittee asked Seago to produce:

• **The NSC directive** which created OSI or "specific authority for not producing it."

• **A written answer** as to why "Congress was not asked for a clear mandate" in setting up OSI, rather than having it set up through directives and orders.

• **Minutes** of all meetings of the Interdepartmental Advisory Committee on Publication and a similar committee on international exchanges. Seago said he would try to provide those, but he might have to withhold them if counsel decides they fall into the category of "internal working papers."

• **A guide issued** to agencies to help them handle requests from Soviet bloc countries for non-classified information.

• **A full explanation** of what the NSC meant by "implementation" in saying the Commerce and OSI "shall be responsible for the implementation of certain policy determinations" governing unclassified information.

• **An answer** as to whether Seago feels his office is qualified to assess the technical value of information. Seago had testified, "To answer that yes or no would be improper."

• **A list** of the material obtained through exchange.

• **Evaluation reports** of material obtained. Agencies will begin filing these with OSI soon.

Moss Conclusion

The day after Seago testified Rep. Moss told the American Society of Newspaper Editors that his subcommittee now had questioned all three directors and past directors of the OSI, including the first one, R. Karl Honaman, and "we haven't the slightest idea what this office is supposed to do because none of these directors have themselves known."

Seago testified he had had little to do with business and industry in his 11 months in office. However, in a speech before the Chemical Society last fall, he outlined his hopes in this direction:

"As policies become firm and accepted in government, they will then in some instances be offered to business and industry in the hope they can be voluntarily followed. The ice in this field has been broken for OSI, and our efforts now are to balance the entire OSI program . . .

"The contest we are in is not that of the usual form of battle, as our contest is a battle of tools, machinery, electronics, guided missiles and supersonic airplanes and information with respect to these items.

"It is accordingly important that we not overlook the consequences of giving too freely of such strategic information to our possible opponents. While we are hopeful of greater international good will since the Geneva Conference, these are not normal times and the problem of strategic information should be thought of in the environment of today."

New Secrecy Heights

Washington—Rep. Dan Flood (D.-Pa.), a member of the Defense Appropriations Subcommittee, tells this story to illustrate the lengths to which secrecy in government can go:

Rep. Flood wanted to know why plush passenger interiors were being installed in Military Air Transport Service planes which originally were explained to Congress as heavy-duty cargo planes. He wrote to Comptroller General Joseph Campbell asking for that and other information.

The letter came back with every page stamped "secret." In his reply to Campbell, Flood wrote:

"I do not think that anyone has the right to classify my letters of inquiry as 'secret' and certainly not without consultation with me, and I hereby declassify that letter."

Army Wins Inter-Service Fight To Train Its Own Aircraft Pilots

Washington—The U. S. Army has won its fight for the right to train airplane and helicopter pilots independently of the Air Force.

By early summer, the Army will advertise for proposals from civilian contractors to operate schools at two Texas bases scheduled to be taken over from the USAF:

- **Gary Air Force Base** for primary fixed-wing training. This assignment has been carried out in the past by the USAF, producing about 1,800 Army fliers annually.
- **Wolters AFB** for primary cargo-helicopter training. The Army has been training these pilots at Ft. Rucker, Ala. Cargo helicopter units have been demanding about 800 pilots a year, a rate that will increase as aircraft deliveries are speeded up. The pilots are enlisted men or warrant officers who have had no previous flying experience.

Drafting of specifications on which prospective contractors will be asked to submit proposals got under way at the Pentagon last week. Details of the program are being worked out at a series of conferences attended by Army officers from the field and the Aviation Center at Ft. Rucker.

No details are available except that successful bidders will provide instruction and maintenance. Aircraft will be furnished by the Army.

Army Mission Remains Same

The decision to let the Army conduct its own training program was made by the Defense Department after a long wrangle, most of it involving USAF objections to the Army's growing aviation organization.

In giving the Army full responsibility, the Defense Department made it clear it was not altering the roles and missions of Army aviation. Further, it is not authorizing expansion of the Army flying program beyond the roles and missions recommended by the Joint Chiefs of Staff.

An earlier attempt by the Army to turn over primary cargo helicopter training to a private contractor was sidetracked a few months ago because of USAF objections. All proposals submitted at that time were rejected pending final settlement of the issues.

USAF Concern

It has been no secret that USAF's concern over the Army aviation program has been matched by Army dissatisfaction with Air Force control of its fixed-wing training.

One of the paradoxes of the situation has been that USAF uses private contractors to train its own fixed-wing pilots, but USAF instructors are used to train Army officers.

The Defense Department said last week that the Army will start its programs at Gary and Wolters this summer as the Air Force withdraws and transfers the property. Wolters is an Air Force engineering base and has no landing areas. A construction program will be initiated to provide helicopter landing mats and a strip for light fixed-wing planes. Buildings at the base are adequate for hangar, maintenance and administrative purposes.

Lufthansa Orders 707

Lufthansa German Airlines ordered four Boeing 707-320 intercontinental jet airliners last week. Scheduled to go into service during 1960 and 1961, the aircraft will be powered by Pratt & Whitney JT4 engines and equipped with Boeing-developed sound suppressors and thrust reversers.

Typical flight times with the jetliners, according to Lufthansa, will be New York to Hamburg, six hours 45 minutes; Paris to Dakar, four hours 40 minutes; Dakar to Rio de Janeiro, five hours 50 minutes.

Symington Continues Hearings

Washington – Gen. Carl Spaatz, (USAF, ret.), first Air Force chief of staff, pointed to Russia's fleet of 400 submarines as the major threat confronting the U. S. and urged that the Navy concentrate on meeting this threat "instead of building super carriers," in testimony before the Senate Air Power Investigating Subcommittee headed by Sen. Stuart Symington (D.-Mo.).

Gen. Spaatz and Adm. Robert Carney, (ret.), former Chief of Naval Operations, testified at the second session of the subcommittee. At the first session, the witnesses were two World War II ground officers—Gen. Walter Bedell Smith and Gen. Omar Bradley, (AW Apr. 23, p. 40).

The Russian submarine threat will increase over the next few years, Spaatz said, as they become equipped with guided missiles.

Spaatz estimated that the U. S. today is "qualitatively" superior in air power to the USSR, but said that, whether this advantage overcomes the Russian quantitative advantage, "is anyone's guess." He called for more strategic air bases, saying that more "dispersion" is required for U. S. airpower.

The armed services should be reorganized and placed under a single general staff, Spaatz declared. He said that, "with the present unwieldy organization, it doesn't surprise me it takes time to ever get anything done."

While emphasizing the importance of U. S. achievement of an intercontinental missile, Spaatz said, the primary feature of Russia achieving a 1,500-mile range missile first "would be psychological rather than military. I doubt it would be much more a threat to European nations than the planes they now have."

Spaatz said USAF intelligence after World War II reported that Russia would have an atomic bomb by "1949 or 1950" but that the report was "not given consideration by the Army, the Navy or scientists."

In the event of an atomic stalemate, Adm. Carney declared, the U. S. would be "at a terrible disadvantage" in meeting a war with conventional weapons.

Second Global Service Favors TWA, NWA

Extension of Trans World Airlines' international routes to Manila to form a second American flag round-the-world service has been recommended by Civil Aeronautics Board examiner Walter W. Bryan.

The new route would extend TWA beyond its present terminal at Colombo, Ceylon, to Manila via Bankok. The carrier could then link its Far East routes with Northwest Airlines' transpacific route which terminates at Manila.

If the CAB approves the examiner's decision, TWA and Northwest will be able to compete with Pan American World Airways for round-the-world passenger traffic. The CAB approved a link between Northwest and TWA at Shanghai before the Communist conquest, but the carriers cannot operate their routes to the China mainland.

The examiner said the new route would give the two carriers a share in a market from which they have been excluded by political considerations. He also feels that a second U. S. service around the world will provide a yardstick to measure the economic performance of Pan American's subsidized operations.

F. B. Rentschler Dies

Frederick Brant Rentschler, board chairman of United Aircraft Corp., died April 25 at his winter home at Boca Raton, Fla. He was 68 years old.

One of the pioneer leaders in the growth of U. S. aviation, Rentschler began his air career in World War I, and helped to start Wright Aeronautical Corp. in 1919, becoming president of the firm shortly after its founding. In 1924 he left Wright and in August 1925 founded Pratt & Whitney Aircraft Co. with a handful of associates.

The small group quickly designed and built the first Wasp 400-hp. radial air-cooled engine, which soon established itself as one of the world's leading aircraft powerplants.

Late in 1928, he helped organize United Aircraft & Transport Corp., which became the present United Aircraft Corp. in 1934.

Senate Group Finds Demon 'Total Loss'

Washington—The Senate Preparedness Investigating Subcommittee last week expressed skepticism over the value of the Navy's new FIRM (fleet introduction of replacement models) procurement plan in a report writing off the $300 million F3H-1 "Demon" fighter program (AW Oct. 10, p. 16) as a total loss "except for the lessons learned."

Two other congressional groups—the House Military Operations Subcommittee, headed by Rep. Chet Holifield (D.-Calif.), and the House Military Appropriations Subcommittee, headed by Rep. George Mahon (D.-Tex.)—already have completed investigations of the "Demon," built by McDonnell Aircraft Co., and powered by a Westinghouse J40 engine.

Pointing out that the Navy's decision to proceed with F3H airframes before an engine had been devised was made during the stress of the Korean emergency, the Senate Subcommittee, headed by Sen. Lyndon Johnson (D.-Tex.), commented:

"That it did not work out was unfortunate, but the Navy may not validly be criticized for the decision. . . . On the other hand, we do not think any blame for the failure of the program may be laid at the door of earlier procurement practice . . .

"If FIRM were in effect in 1951, the end result obviously could have been no different since airplanes require engines under FIRM as well as under any other plan. Translating FIRM into wartime conditions by compressing the time factor might conceivably have resulted in less cost but the possible advantage of successful speculation would have been foregone."

The subcommittee directed the Navy to make periodic progress reports to it on the results of the FIRM plan. It also directed the Air Force, to make reports on its procurement policies under the similar Cook-Craigie Plan. "The quality of the new procurement procedures has not yet been established," the subcommittee added.

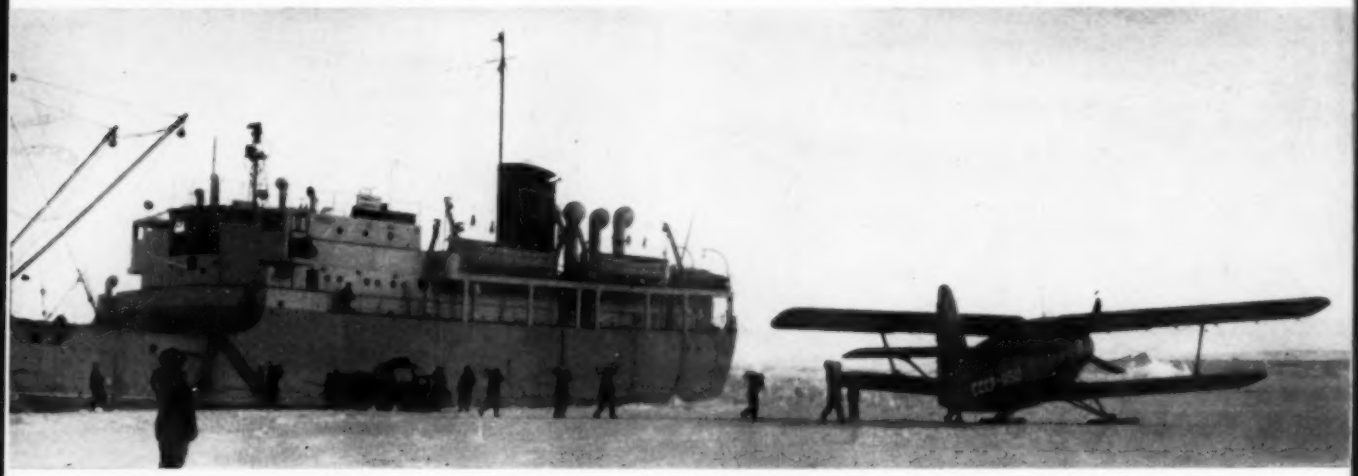
Martin Co. Wins Phase I Bomber Competition

The Martin Co. has won the Phase I preliminary weapon system competition for a supersonic tactical bomber for the USAF. A development contract is to be announced this week.

The award to Martin will be the first under the Phase I concept initiated by the Air Force last year (AW Aug. 8, p. 13). Contracts are awarded to selected companies to design weapon systems and submit mockups for evaluation.

Martin's proposal for the tactical bomber weapon system was selected over that of Douglas Aircraft Co. One of Martin's designs was capable of zero-length launching.

Other Phase I contracts were awarded to North American Aviation, Northrop Aircraft and Lockheed Aircraft for a long-range interceptor; and to North American and Republic Aviation for a fighter-bomber. North American Aviation has won the long-range interceptor competition (AW Mar. 26, p. 23).



Soviet Air Support For Antarctic Survey

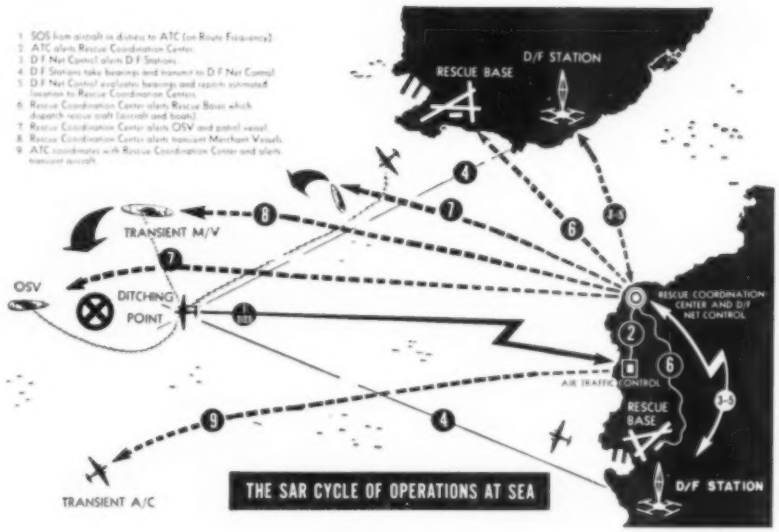
A ski-equipped Antonov AN-2 Colt freighter (above photo) loads food from a freighter for an outlying camp during Soviet's first penetration of the Antarctic. Below an LAR-3 Hound helicopter and a twin-engine Il-12 transport stand by one of these survey camps.

Services Standardize Search and Rescue

Washington—The first official manual governing aircraft emergency procedures over water for both civil and military aircraft will be distributed this week by the U. S. Coast Guard.

Compiled with the assistance of the Navy and the Civil Aeronautics Administration and bearing the additional endorsement of the USAF, the 115-page manual outlines and standardizes overwater search-and-rescue procedures for the Air Force, Navy, Coast Guard and U. S. civil airliners on overseas flights.

The manual, independent of but directly related to the Air Coordinating Committee's recent publication of a national search-and-rescue plan (AW April 16, p. 132), bears the authorization of U. S. Coast Guard Commandant A. C. Richmond, Adm. Arleigh A. Burke, Chief of Naval Operations, and Gen. Nathan F. Twining, USAF Chief of Staff.


1. SOS from aircraft in distress to ATC (on Route Frequency)
2. ATC alerts Rescue Coordination Center.
3. D F Net Control alerts D F Stations.
4. D F Stations take bearings and transmit to D F Net Control.
5. D F Net Control evaluates bearings and reports estimated location to Rescue Coordination Center.
6. Rescue Coordination Center alerts Rescue Base which dispatch rescue craft (aircraft and boats).
7. Rescue Coordination Center alerts OSV and patrol vessel.
8. Rescue Coordination Center alerts transient Merchant Vessels.
9. ATC coordinates with Rescue Coordination Center and alerts transient aircraft.
RESCUE BASE
D/F STATION
TRANSIENT M/V
OSV
DITCHING POINT
RESCUE COORDINATION CENTER AND D/F NET CONTROL
AIR TRAFFIC CONTROL
RESCUE BASE
D/F STATION
TRANSIENT A/C
THE SAR CYCLE OF OPERATIONS AT SEA

Distress Procedures

Specifically, the manual outlines the proper distress procedures to be followed by the aircraft, the receiving station and surface and airborne rescue craft, and makes rule-of-thumb suggestions as to the best way to ditch a crippled aircraft at sea. It also bears this warning:

"Because of the many variables in aircraft emergencies and SAR operations, it is impracticable to cover every possible contingency which may arise. Likewise, it is undesirable to set forth procedures and techniques which are so detailed and rigid that on-the-scene flexibility is sacrificed. Hence, many of the procedures and techniques contained herein should be tempered with judgment and due regard for unusual conditions existing at the time. . . ."

For a pilot in actual distress, the manual, entitled "Aircraft Emergency Procedures Over Water," bears these instructions:

- **Turn on emergency IF.**
- **Transmit three times** "SOS" on MCW if available or CW and/or "MAYDAY" on voice followed by aircraft identification repeated three times.
- **Transmit on normal air-ground** frequency. If this channel fails, use any of the following frequencies: 121.5 mc., 243 mc., 500 kc., 2182 kc., or 8364 kc., depending upon distance and time of day.
- **Send distress message** including position, course, speed and altitude; nature of distress, intention as to bailout or ditch, type of assistance required (escort, ditch heading, etc.).
- **At end of message,** give two 10-second dashes followed by identification of aircraft.
- **Immediately prior** to bailing out or ditching set radio for continuous emission.

Successful Ditching

Factors determining a successful ditching, the manual says, are sea conditions and wind, type of aircraft and skill and technique of the pilot.

"Other factors being equal," the manual explains, "the larger the aircraft, the better are its ditching characteristics," although it gives the nod to transport aircraft over heavier bombers since the latter "is greatly weakened by large bomb bay doors and failure of these . . . can result in violent behavior of the aircraft on runout. . . ."

Fighter aircraft, the manual says, "often react violently on ditchings" because of their "higher landing speeds and smaller size." It adds, however, that due to the fighter's "strong fuselage and cockpit, as well as the shoulder harness worn by the pilot, the survival rate is high."

Rapid Deceleration

The manual notes that "the great danger to an aircraft during ditching is rapid deceleration. . . . Extensive damage and injury to personnel may be experienced upon contact with water." Minimizing these dangers depends upon selection of the optimum ditching heading. General rules suggested include:

- **Best ditching heading** usually is parallel to the major swell system and down the minor swell system.
- **Never land into** the face of a primary swell system (or within 30 to 45 degrees of it) unless the winds are extremely high.
- **Choice of ditching heading** should be determined by the heading that gives

NIGHT DITCHING IS ASSISTED by Coast Guard ship which marks 7,500 ft. sealane, sets flares and fires star shells to guide aircraft.

the greatest component of wind on the nose of the aircraft.

The pilot's job is essentially to set the aircraft down on a proper heading in the right spot at the best combination of attitude and speed. Once first impact has been made, there often is little he can do to control a landplane. In a seaplane, however, the skill of the pilot remains important since he normally can control the plane through the runout.

Since an emergency may arise at any time, the SAR manual outlines procedures for a number of conditions. Included are procedures for ditching under night and instrument conditions. Other conditions considered are without escort, with escort and with very low visibility and ceiling.

Two sea-going aids available to distressed aircraft and highly recommended by the Coast Guard are the Ocean Station Vessel and the merchant vessel. The OSV can be called on to effect a rendezvous, assist in the aircraft's ditching and rescue survivors.

SAR Intercept

Another important element of search-and-rescue operations is that of intercept and escort of distressed aircraft. The SAR manual devotes a full chapter to basic intercept and escort procedures. Once an intercept is made, the escort aircraft can provide such services as navigation, communications, radar and ditching assistance.

Final chapters of the manual are devoted to preparation for ditching, survival, first aid and emergency check-off list.

The difficult tasks that must be performed at the critical time of a flight emergency can and should be reduced as far as practicable, the Coast Guard says.

The manual urges adequate attention to the survival of personnel beginning at the time the aircraft is manufactured, to the design of survival equipment, the development of routine and emergency procedures, and intensive and repeated flight crew training by class instruction and ditching drills.

The Coast Guard took the initiative in preparing a SAR manual because of its statutory responsibility for developing, establishing, maintaining, and operating rescue facilities for the promotion of safety on and over water. The assistance of the Armed Forces is available because they provide search and rescue facilities in support of their own operations and make them available to meet civil needs.

Copies of the manual, which costs $2.25, can be ordered from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

News Digest

General Electric T58 turbine of 1,000 eshp. will be shown publicly for the first time during twelfth annual forum of American Helicopter Society in Washington, D. C. May 2-5.

First HR2S Sikorsky transport helicopter accepted for delivery to the Navy was flown non-stop from the Bridgeport, Conn., factory to the U. S. Naval Air Test Center, Patuxent River, Md., carrying an equivalent payload in excess of military requirement. The helicopter, with an average ground speed of 101 mph., completed the 236-mile flight in two hours, 36 minutes.

Fairchild J44 turbojet received a Civil Aeronautics Administration type certificate, making the 1,000-lb. thrust powerplant available for use on civil aircraft. Fairchild has built more than 560 J44s since quantity production began in 1950.

Liquid-propellent rocket engine facility is being built by Aerojet-General Corp. at Neosho, Mo. USAF awarded the firm a $9.5 million contract for the new facility, scheduled for completion late this year.

Negotiations are being completed by Thiokol Chemical Corp., Trenton, N. J. for purchase of 10,000 acres for erection of a multi-million dollar rocket and missile plant and test center near Corinne, Utah. New plant will employ 400-500 persons initially.

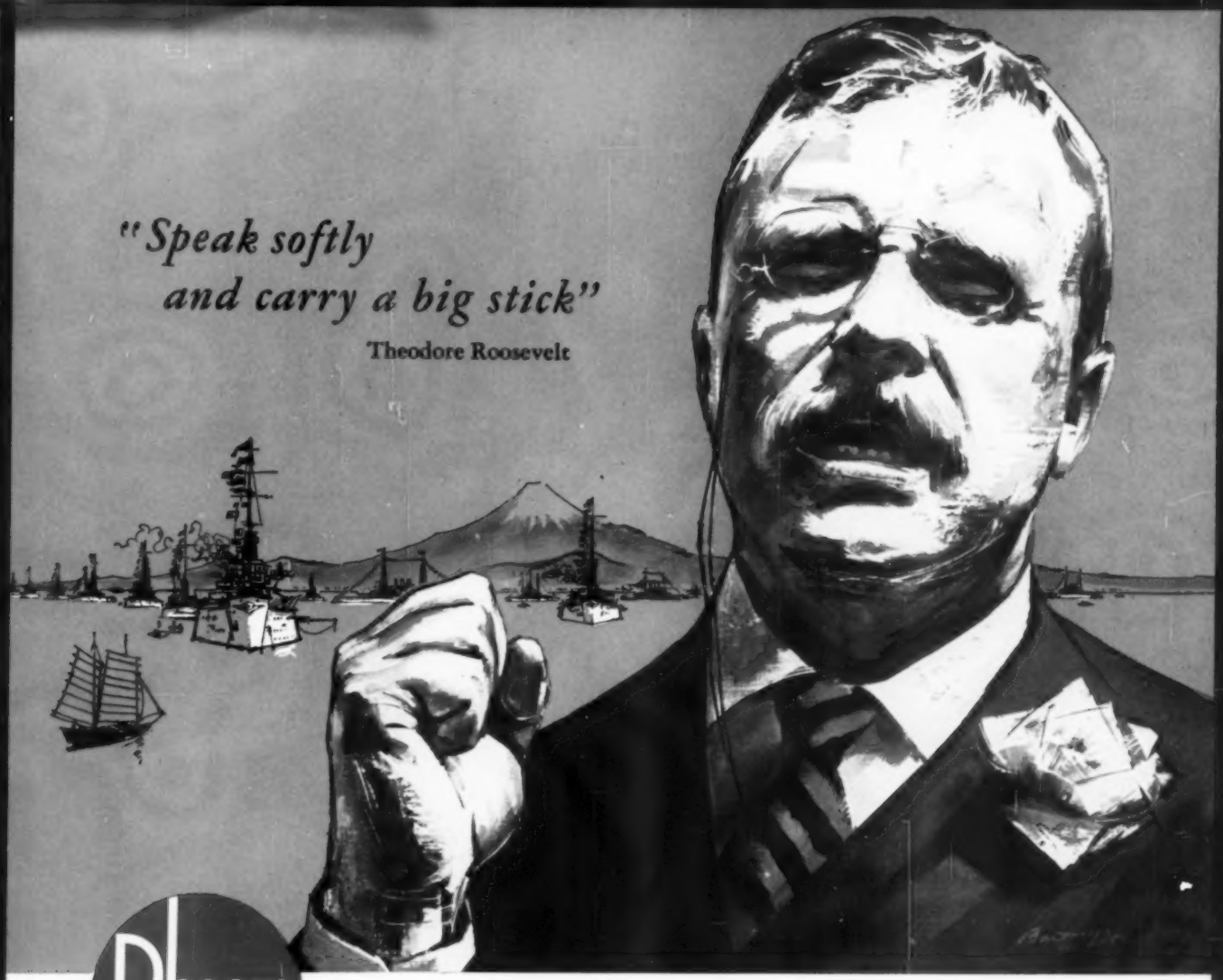
Research and development volume of nearly $14 million for Fiscal 1956 is forecast by Cornell Aeronautical Laboratory, Inc., Buffalo, N. Y., representing an increase in excess of $1.5 million over the preceding fiscal year. The laboratory's backlog as of Mar. 31: $11.25 million, a decrease of $1.75 million from the same date last year.

Two Vickers Viscount 770Ds have been ordered by Philippine Air Lines for use on main domestic trunk routes and Manila-Hong Kong service. PAL's contract brings total Viscounts delivered or ordered to 304. The 770D has Rolls-Royce Dart RDa. 6 Mk. 510 engines.

Military Aviation Funds

The three military services had an unobligated balance of $12.7 billion on hand as of March 1 for contract letting for aircraft, engines, parts, guided missiles and electronics procurement. The unexpended balance was over $22 billion.

	OBLIGATIONS (000 Omitted)		EXPENDITURES (000 Omitted)	
	July 1, 1955 Through Feb. 29, 1956	Unobligated Balance Mar. 1, 1956	July 1, 1955 Through Feb. 29, 1956	Unexpended Balance Mar. 1, 1956
Aircraft, Engines, Parts				
Air Force	$1,099,280	$7,933,270	$3,487 618	$11 911,849
Navy	972,356	2,430,896	1,020,289	5,129,778
Army	−16,181	167,859	57,441	333,925
TOTAL	2,055,455	10,532,025	4,565,348	17,375,552
Guided Missiles				
Air Force	416,198	688,320	432,090	1,285,092
Navy	149,976	205,464	118,719	466,003
Army	236,670	127,750	260,953	768,838
TOTAL	802,844	1,021,534	721,762	2,519,933
Electronic & Communications Equipment				
Air Force	136,152	897,132	357.181	1,364,261
Navy	86,885	126,217	55,974	313,351
Army	46,768	119,146	91,312	441,394
TOTAL	269,805	1,142,495	504,467	2,119,006



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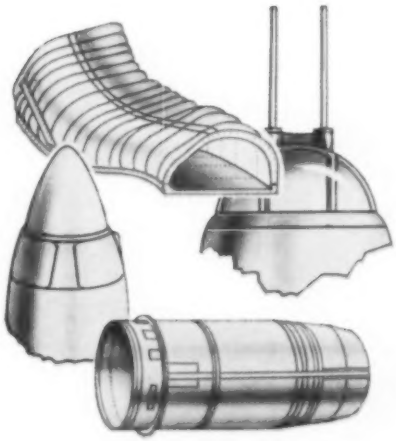

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Airline Pattern Set During Rizley Tenure

Basic outlines for airline future were decided upon during Rizley's one-year CAB chairmanship.

By Craig Lewis

Washington—The past year became a decisive period for the nation's airlines when two basic patterns in the industry's future took shape. In a four month period at the end of 1955, the airlines decided what their equipment would be in the coming jet age, and the Civil Aeronautics Board decided how the carriers will compete with each other for the growing air travel market.

The airline's future, and their success with their new equipment, depends to a large degree upon the success of the major rework of the competitive pattern accomplished by the CAB last year.

A key factor in this revision of the pattern of competition was Ross Rizley, chairman of the CAB during the past year and now returned to his native Oklahoma as a federal judge.

Rizley Set Pattern

Rizley's term on the Board is the key to the new pattern in two ways. His prompting accelerated the administrative pace of three major route cases and the long-standing Large Irregular Case and brought them to a vote before the end of 1955. The decisions and action on reconsideration petitions were completed on all four cases just as the year ended and as one member of the 1955 Board, Josh Lee, left the CAB.

Chairman Rizley's vote on the cases is the other key. His was the deciding vote on an often bitterly divided Board. Where the Board split on the particulars of applying its new competitive philosophy, Rizley teamed with Josh Lee and Vice Chairman Joseph P. Adams in favor of more competition.

Actually, members Chan Gurney and Harmar D. Denny went along with the Board on most of the route awards, although they chose to dissent on some of the awards in the Denver Service Case and the Northeast-Southwest Case. The most violent difference of opinion came when the three-member majority voted to allow the newly constituted Supplemental Air Carriers to operate 10 flights a month in scheduled service.

This decision in the Large Irregular Case has brought strong and bitter criticism of the Board from the scheduled airline industry, and most of the criticism has been aimed at Rizley. The general fact that CAB appointees rarely have airline background has been particularly applied to Rizley, and he has been criticized for taking the job as CAB chairman when he expected to leave the Board before his term was up.

Public Consideration

In the face of this criticism, Rizley views his record at the CAB with considerable pride. The former chairman told AVIATION WEEK during an interview last week that the CAB has rewritten the map of the United States for airline service, and he feels that both the airlines and the traveling public are better off.

Rizley said service to the traveling public was a primary consideration in the decisions the Board made. He feels the public is getting more and better services at lower rates than ever before.

The smaller trunk airlines also made substantial gains during the year, according to Rizley. He thinks the major route decisions will help the weaker lines without damaging the healthier carriers.

The twin purposes of improving service to the public and strengthening the position of the smaller, regional carrier were recurrent themes in the majority opinions in the New York-Chicago Case, the Denver Service Case and the Northeast-Southwest Service Case.

The Large Irregular decision also cited improvement of service to the public as a basis for the authority it granted.

Rizley feels the upward trends, which continued in airline records for the first quarter of 1956, show that the CAB was right in its judgment last fall. He also points to the favorable reaction the new policy received from Congress as further justification of the Board's new philosophy.

President Is Pleased

President Eisenhower is reportedly highly satisfied with Rizley's record with the CAB and pleased with the accomplishments of the Board as a whole over the past year.

Referring to criticism that he and other Board members have come to the CAB without any airline background, Rizley concedes that airline experience would be helpful to a CAB member. But he feels that, since the Board is a

NYA Adds Bell 47H for Charters

Three-place Bell 47H has been added to New York Airways helicopter fleet to handle charter operations that are uneconomical for the airline's Sikorsky S-55s. NYA also uses the 47H for surveying heliport sites.

regulatory body, it also needs members who understand the views of the traveling public.

Rizley feels that a Board member should "wear the traveling public's hat" and see that it is protected with legitimate fares and adequate service.

Ross Rizley came to the CAB on March 1, 1955, with the reputation of an administration trouble-shooter, and he was generally welcomed as a man who could bring the agency out of the doldrums which had plagued it in the months preceding his appointment.

The chairman continued in the good graces of most of the industry until late last year when the four major decisions were made. During the year, he promoted a noticeable increase in the tempo of work at the Board, and while his program caused some minor unhappiness within the CAB staff, most staff members appear to be satisfied with his administration.

Rizley feels there was a substantial increase in the efficiency and productivity of the CAB while he was there. He has high praise for the CAB staff and thinks a sterner brand of encouragement was all they needed to improve their production.

Case-Load Cut

While the Board probably brought more major cases to completion in 1955 than in any other year, Rizley points out that the CAB was more efficient in processing its business and cut the average time required to handle a case from 274 days in Fiscal 1954 to 257 days in Fiscal 1955.

Rizley points out that there has been a substantial improvement in the subsidy position of the airlines over the past year. Subsidy estimates show a decline from $66.2 million in Fiscal 1954 to $47.5 million in Fiscal 1955 and $43.2 million in the current fiscal year.

Subsidy for the coming fiscal year is estimated at $46.5 million, but various deductions, including offset considerations and capital gains coupled with a $14 million carryover from Fiscal 1956, mean the CAB only has to ask for $20 million in Fiscal 1957 to pay subsidy to the airlines.

During Rizley's tenure, service mail rates were reduced about 25%. All domestic carriers were put on a uniform rate, and substantial reductions were made in the service rates for transatlantic, transpacific and Latin American operations. Pan American World Airways entire system was put on a final mail rate for the first time last December.

After Congress decided last May that the CAB should give local airlines permanent certificates, the Board set up a policy and issued the certificates to all the local airlines by the end of 1955.

The Board ran into some difficulties with the bilateral air agreements negotiated during the year in conjunction with the State Department. A Senate committee questioned the merits of the pact signed with West Germany, and nobody was very happy with the complex agreement signed with India. Negotiations with Mexico proved as fruitless as they have in past years.

Free Ride Issue

Another controversial issue of Rizley's tenure was the announced policy of allowing certain CAB staff members to accept free rides on the airlines in order to give them some background in actual airline operations. The move generated considerable criticism and was never actually put into operation.

Rizley feels relations between the CAB and both the White House and Congress improved while he was in office. He says the Board was highly successful in working out a system of cooperation with the White House and feels that the White House understands the Board's problems better than before. Rizley thinks the key to the situation lies in keeping the White House informed of the Board's views and the reasons for its actions.

The backlog of international cases which used to gather dust for months in the White House awaiting presidential action has been cleared and the decisions issued in such long-standing proceedings as the Balboa Case and the Transatlantic Cargo Case.

Just before Rizley took office, the White House released its decision on the Transpacific Renewal Case and the West Coast-Hawaii Case in a series of actions marked by extremely clumsy handling. Subsequent White House handling of international cases has been considerably more adroit.

Rizley left the Board feeling that the airlines are generally better off under the new competitive system fashioned last fall, in spite of industry grumbling. And he is convinced that the reality of new competition will produce a better, cheaper service.

New York Heliport Net Proposed

New York—An "aerocab" network of six heliports in this metropolitan area was proposed last week by Thomas M. Sullivan, aviation planning chief of the Port of New York Authority. To connect six urban centers with each other and with New York International, LaGuardia and Newark airports, five new sites are needed: at midtown Manhattan on the East Side waterfront, downtown at the Battery, on the Brooklyn waterfront, on the north end of Staten Island and in Newark, N. J.

The recently approved West 30th St. strip (AW April 2, p. 90) alone, Sullivan told members of the Regional Plan Association at a regional heliport conference in Manhattan, will handle a million passengers annually within ten years. This total is greater than the number of ship passengers handled last year in the Port of New York.

The temporary 30th St. heliport will cost at least twice the original $50,000 estimate because of changes required by the city, including an extension 45 feet out over the river.

The Regional Plan Association is working for an overall system of heliports to link communities of the tri-state (N. Y., Conn. and N. J.) region.

John M. Buckley, consulting engineer for New York City's Department of Marine and Aviation, spoke of a need for integrating New York's heliports with other facilities to preserve the "sound economical use of highly valuable urban realty." The ground-level heliport at West 30th St. should give way, when equipment permits, to "integrated" facilities, Buckley said, and the City continues to favor the rooftop plan for the long run.

Glen B. Eastburn, assistant to the president of New York Airways, pointed up the need for planning ahead by the communities for heliport facilities. He stressed the desirability of proper zoning for heliports, the requirement of about one acre of land for a heliport, and the importance to a community of heliport facilities, regardless of whether scheduled service is imminent or not, for charter and emergency operations.

J. P. W. Vest, executive assistant to the chief engineer of Sikorsky Aircraft Division of United Aircraft Corp., told the plan group that any heliport operationally suitable for today's helicopters probably would be suitable for future rotorcraft.

Use of his firm's Bell 47-G helicopter in the metropolitan area, according to Wilson P. Foss, III, president of the New York Trap Rock Corp., suffers from an "appalling" number of restrictions. If the executive helicopter is going to be useful, Foss said, more landing facilities must be readily available. He called for delegation of more authority to pilots in utilizing possible landing sites.

Mayor Thomas F. J. Quigley of Stamford, Conn., reported that his city of 90,000 without an airport, has found their heliport a civic asset. The facility is an 80% filled dump with added snow fence; the city hopes next year to build a "real modern heliport."

PLANE-TO-HELICOPTER transfer is made by passengers who have purchased through-service tickets and need not enter terminal.

Equipment Lack Hampers LAA Growth

By Richard Sweeney

Los Angeles—Rounding out its first full calendar year of carrying passengers, Los Angeles Airways finds itself far from financial break-even and facing a paradox:

- **U. S. Post Office** Department would like to see the line's subsidy reduced as soon as possible.
- **Use of the line's** five Sikorsky S-55 and two S-51 helicopters is heaviest for first priority mail at the same hours when the largest passenger potential exists, in effect blocking a stream of revenue which would boost the line toward break-even.

LAA president Clarence M. Belinn feels the current bottleneck in helicopters, and navigation and weather flying equipment for them, prevent his operation from achieving maximum potential. He believes that today, no company has a helicopter under development which will:

- **Carry** at least 20 passengers and an adequate mail-express-baggage cargo.
- **Be operable** in metropolitan Los Angeles' unique weather situation on schedules as reliable as those of major airlines, day or night, IFR or VFR.
- **Carry these loads** at direct operating costs much lower than today's machines.
- **Have two engines**, for safety, and one rotor, to reduce rotor head inspection and service, one of the most expensive components in helicopter operations.

No Commuters

Presently, Belinn does not envision a commuter-type service for the Los Angeles metropolitan area, at least not for many years until proper equipment becomes available.

Last year, LAA carried 5,183 passengers a total of 156,000 passenger-miles. Seat-miles available were 753,000, giving a revenue load factor of 20.72%. The line started the year operating between Los Angeles International Airport and Long Beach, later adding runs from the airport into eastern Los Angeles County and adjoining San Bernardino.

The line also carried 6,015,842 lb. or 53,226 ton-mi. of mail, and 1,505,174 lb. or 28,851 ton-mi. of express for a combined total of 89,151 ton-mi. flown, against 213,575 ton-mi. available, for an aircraft load factor of 39.89%.

LAA flew a total of 478,406 scheduled miles, of which 423,600 were revenue-miles, for an overall performance factor of 88.54%.

Questionnaires given passengers indicate most are satisfied with helicopter transport and LAA service in general, but almost unanimously agreed that when flight time exceeds 15 min., noise and vibration of the S-55 became annoying. Recommendations for passenger terminals at each of the LAA stops were made by many.

LAA found out passenger service was best accepted on runs longer than 30 mi. Travelers gave a variety of reasons for using copters, mostly either to save driving time, cost, and car storage fees, or to gain extra time at Los Angeles Airport before leaving on long trips. Several passengers traveled LAA from far out communities for shopping expeditions.

Passenger service now is set up primarily to and from connecting long distance flights of major airlines. Belinn hopes the eventual extension of this will be agreements with the major carriers whereby at a cost of $2 more, the passenger will travel by air from his home town to his destination and back, using LAA, a large carrier and another helicopter service at the other end of the trip. Differential between the passenger's $2 and full cost would be borne by the big airlines. Belinn has such an agreement with Trans World Airlines now, and TWA has a similar agreement with New York Airways in New York.

Under this system, passengers are ticketed by air all the way through from

MAIL PICKUP at Santa Ana Heliport, where LAA S-55 lands beside ready mailbags.

MOTOR SCOOTER carries passengers and baggage to outgoing airliner or terminal.

their home towns. They board the copters, are transferred at Los Angeles International from the LAA flight directly to their large plane without having to enter the terminal. Baggage accompanies them. The same procedure holds true on return, from plane to copter.

Expansion Plans

Based on its year's experience in better utilization of equipment on passenger runs, LAA this year plans a 50% expansion of its passenger service. Knowing that travelers can be induced to board the helicopters at off-hours when starting long journeys from outlying Los Angeles areas, the operator figures the same can be done in the closer-in and densely populated San Fernando and San Gabriel Valleys, where the expansion will occur.

Looking toward real expansion based on the helicopter's full potential on short hauls, the airline has pioneered in copter weather flying techniques using conventional attitude instruments and navigation equipment. These, of course, are unusable in maintaining schedules on a fixed-wing carrier standard of reliability.

However, Lear, Inc. has a study contract leading to development of a flight attitude reference system pitched directly to the helicopter's unique needs, from a major copter manufacturer. And at Ft. Hauchauca, Ariz., the U. S. Army has a test installation of Decca which is soon to start exhaustive tests in helicopter operations.

Communications System

LAA has developed its own communications system. Using lightweight Gonset transceivers and a base radio station atop the highest mountain in Southern California, communications can be maintained between base operations, helicopters and the line's various motor vehicles. A special call system makes it possible to connect any two units, air-ground, ground-ground, air-air, without alerting all other receivers, although all operate on the same VHF frequency.

During most of last year, LAA flew its seven-passenger S-55s from 5 to 5½ hr. per day. The S-51s operated solely for mail and express, worked about 2 hr. per day each. LAA finds that combining mail-express and passenger runs is possible now, with their communications system, and that, combined with educating the public to travel in off hours, has raised the line's ability to expand service without buying more equipment at present.

LAA Protest

Los Angeles Airways wants helicopter regulations set up by Civil Aeronautics Board consistent with the nature of helicopter flying and operations. It has sent a strong protest to Washington on the draft releases of CAR No. 56-2, dated Jan. 19, 1956, and CAR 56-3, dated Jan. 19, 1956. Its protest says:

- Los Angeles Airways feels setting up fixed routes for helicopter flights in the Los Angeles metropolitan area would greatly hamper adhering to schedules and conducting safe flights. The line currently operates on a CAB Area-Type Certificate.
- A financial hardship would be imposed by having to hire a fixed-wing type certificated dispatcher. Regulations under which a dispatcher operates are not compatible with copter operations.
- A helicopter transport pilot should not be required to hold a valid fixed-wing instrument rating. LAA points out the only similarity between fixed-wing and helicopter flight under IFR is that both are conducted without visual reference to the ground.

Two C-46 Modifications Approved by CAA

Two modifications of the Curtiss C-46 designed to bring the aircraft into closer compliance with the transport-category requirements have been approved by the Civil Aeronautics Administration; approval of a third modification is imminent.

Operators of the aircraft face an extended CAA deadline of July 1 to begin the revamping.

Improved performance and enhanced fire protection systems are provided by the modification of Air Carrier Engineering Services and L. B. Smith Aircraft Corp., both of Miami. Their improved plane, designated the C-46/CW20T, will gross 47,650 pounds at takeoff, carry 45 to 55 passengers at a 225-mph. cruise speed and fly a 1,635-mile range.

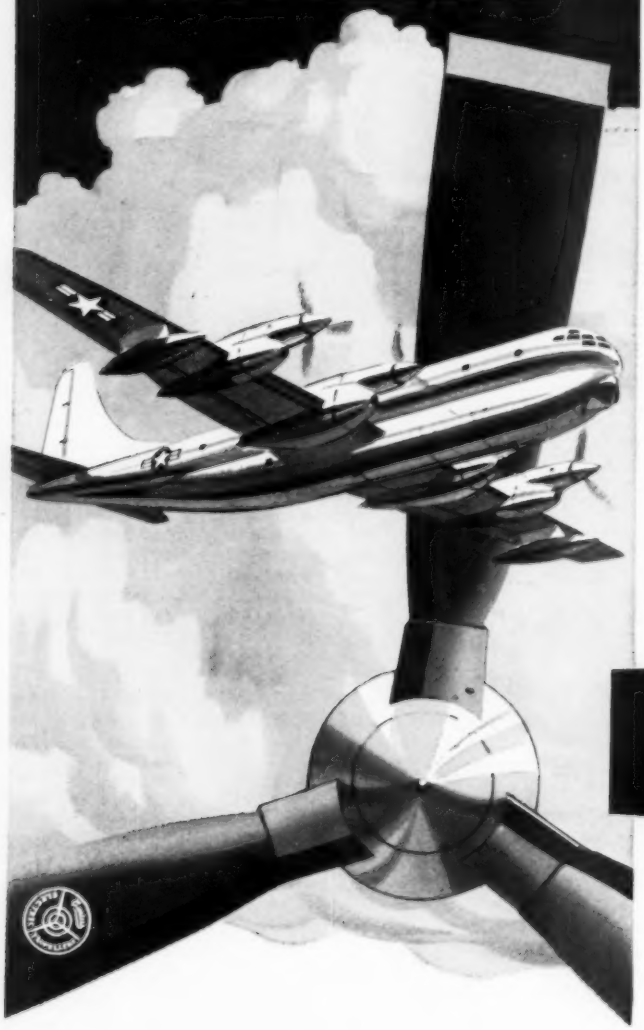
The Aircraft Engineering Foundation of Burbank also has received approval of a C-46 modification, and Riddle Airlines in Miami is expected to receive one soon.

Airline Revenue and Expenses—1955

	Passenger Revenue	Mail Revenue	Express Revenue	Freight Revenue	Subsidy	Operating Income	Operating Expense	Net Operating Income (before taxes)
DOMESTIC TRUNK								
American	227,505,952	5,839,667	4,461,329	14,631,865	.....	255,390,974	217,004,569	38,386,405
Braniff	36,245,709	934,383	555,521	1,003,638	−26,983	39,535,356	35,665,138	3,870,218
Capital	45,897,106	1,217,250	1,155,292	1,172,259	.....	50,849,876	50,355,795	494,081
Colonial	6,969,932	77,154	41,304	155,718	427,508	7,787,265	7,921,645	−134,380
Continental	13,790,391	374,191	134,746	410,519	879,605	16,082,839	15,137,536	945,303
Delta	52,843,394	1,289,761	975,291	1,767,287	.....	57,871,530	50,439,076	7,432,454
Eastern	174,822,644	3,625,045	2,264,626	2,726,326	.....	187,898,687	163,141,268	24,757,419
National	43,073,773	514,266	299,154	1,097,500	.....	46,965,119	39,693,187	7,271,932
Northeast	7,938,798	131,247	96,362	220,494	1,572,513	10,120,300	9,971,913	1,148,387
Northwest	44,555,282	1,575,290	976,006	1,909,291	.....	50,006,229	45,346,044	4,660,185
Trans World	142,042,086	3,433,083	3,272,512	5,194,174	.....	156,556,592	146,445,539	10,111,053
United	196,705,404	7,042,477	4,825,308	8,642,182	.....	222,128,046	201,221,528	20,906,518
Western	28,755,616	862,014	343,492	653,823	.....	31,039,523	26,648,756	4,390,767
INTERNATIONAL								
American	4,472,333	166,949	1,554	535,871	.....	5,365,683	4,471,643	894,040
Braniff	5,666,482	440,484	.....	399,499	369,120	7,263,294	7,761,511	−498,217
Caribbean Atlantic	1,157,502	17,993	.....	42,126	37,472	1,335,543	1,293,456	42,087
Colonial	1,566,843	10,362	.....	19,176	51,351	1,720,141	1,660,617	59,524
Delta	4,045,885	61,033	.....	207,185	.....	4,455,229	4,807,518	−352,289
Eastern	9,519,127	295,206	.....	207,745	.....	10,710,406	8,737,312	1,973,094
National	3,569,357	39,822	15,880	131,027	.....	3,899,541	3,902,419	−2,878
Northwest	12,697,675	5,514,939	59,193	2,594,605	.....	21,357,267	21,600,818	−243,551
Pan American								
Alaska	4,160,975	193,218	.....	897,471	1,364,568	7,778,571	7,360,826	417,745
Atlantic	77,467,059	8,767,463	.....	7,174,245	−1,366,202	97,381,236	91,527,974	5,853,262
Pacific	42,799,825	8,401,486	.....	5,260,083	−929,070	57,622,406	53,684,007	3,938,399
Latin America	55,299,823	2,993,348	.....	9,422,613	3,204,085	75,969,899	72,838,009	3,131,890
Panagra	14,108,687	890,609	.....	1,130,436	86,115	17,979,301	17,071,532	907,769
Trans World	47,188,472	6,953,978	.....	3,638,160	.....	60,736,760	59,293,806	1,442,954
United	11,106,820	448,940	.....	192,779	.....	11,962,537	9,623,057	2,339,480
LOCAL SERVICE								
Allegheny	3,646,297	95,129	110,088	.....	1,622,942	5,551,508	5,748,249	−196,741
Bonanza	1,356,670	38,329	15,516	28,952	883,481	2,400,878	2,427,400	−26,522
Central	875,515	77,223	11,020	33,024	2,116,645	3,144,371	3,049,659	94,712
Frontier	2,506,938	119,944	36,029	211,339	2,563,915	5,522,749	5,469,394	53,355
Lake Central	1,048,610	69,197	70,666	.....	1,377,504	2,598,046	2,585,434	12,612
Mohawk	3,391,387	43,392	33,493	55,020	665,872	4,307,476	4,318,126	−10,650
North Central	4,922,787	187,703	126,476	.....	1,502,186	6,811,289	6,594,510	216,779
Ozark	2,271,816	96,719	68,069	.....	1,760,568	4,300,198	4,360,369	−60,171
Piedmont	4,333,828	88,732	53,285	76,937	1,672,749	6,406,532	6,397,708	8,824
Southern	1,660,644	106,860	56,478	.....	1,668,244	3,567,291	3,471,414	95,877
Southwest	2,781,027	74,259	33,799	51,350	964,812	4,228,022	4,065,489	162,533
Trans-Texas	2,106,091	139,101	33,164	62,701	2,448,992	4,866,352	4,616,206	250,146
West Coast	1,938,894	48,549	15,552	35,593	1,465,803	3,536,962	3,734,008	−197,046
HAWAIIAN								
Hawaiian	3,896,692	37,162	.....	677,649	241,865	5,092,468	5,355,826	−263,358
Trans Pacific	1,789,406	10,656	.....	75,194	49,241	2,021,591	1,980,148	41,443
CARGO LINES								
Aerovias Sud Americana	.....	.....	.....	1,701,132	.....	1,960,356	1,931,908	28,488
Flying Tiger	6,506,270	.....	.....	12,369,504	.....	19,677,237	18,292,499	1,941,053
Slick	4,376,000	40,000	.....	8,101,000	.....	12,517,000	13,495,000	−978,000
Riddle	.....	6,792	.....	2,368,721	.....	3,572,565	2,926,601	645,964
HELICOPTER								
N. Y. Airways	179,684	40,274	29,023	23,277	1,436,600	1,749,792	1,559,996	189,796
Los Angeles Airways	29,230	137,049	70,982	.....	847,508	1,092,398	934,521	181,124
Helicopter Air Service	.....	.....	.....	.....	.....	.....	.....	.....

Compiled by AVIATION WEEK from airline reports to the Civil Aeronautics Board.

U. S. Air Force BOEING YC-97J with Curtiss-Wright TURBOLECTRIC PROPELLERS



. . . in MATS SERVICE makes FIRST TRANSATLANTIC FLIGHT of American TURBOPROP TRANSPORT

A U.S. Air Force Boeing YC-97J turboprop transport, operated by the Military Air Transport Service (MATS), recently accomplished the first transatlantic flight of any American turboprop aircraft, spanning some 11,413 miles between San Antonio, Texas and Rhine-Main Air Base, Germany and return. The 2,360-mile leg from Harmon, Newfoundland to Prestwick, Scotland took only 6 hours, 3 minutes – was hailed by the British press as the "fastest time for a propeller driven aircraft."

Curtiss-Wright Turbolectric Propellers provided precision control of engine speed and fuel reserves through positive pitch change and closer synchronization – combining fuel economy with smoother, quieter operation. These propellers feature the exclusive Curtiss-Wright single-piece hollow steel blade, extruded from a solid billet–without welds or brazing. This construction, assuring higher abrasion resistance and greater strength to withstand impact damage, has been performance-proved by 17.7-million operational hours. Inherent in Turbolectric design are structural reserves for the larger aircraft and greater engine powers that lie ahead.

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Six Trunk Lines Report Salaries

The following reports of officers and directors salaries of six domestic trunk airlines have been filed with the Civil Aeronautics Board:

COLONIAL AIRLINES. Branch T. Dykes, president and director, $29,600 salary (up $607) and $4,884 accrual of proposed retirement benefit plan (up $2,035); Thomas J. Dunnion, vice president, $18,200 salary (up $667) and $2,161 retirement accrual (up $901); L. Orville Cameron, vice president-secretary, $18,000 salary (up $667) and $1,346 retirement accrual (up $561); Carl W. Rach, vice president-operations, $19,500 salary and $2,202 retirement accrual; James E. Reinke, vice president-traffic and sales, $14,000 salary and $871 retirement accrual; Norman D. McDonald, treasurer, $12,000 salary (up $667) and $677 retirement accrual (up $294).

Thomas A. Campo, assistant treasurer, $8,500 salary (up $333) and $443 retirement accrual (up $184); Daniel S. Dunn, assistant secretary, $7,600 salary (up $333) and $311 retirement accrual (up $311); John J. Murphy, director and chairman of executive committee, $12,000 salary (up $1,000) and $1,021 retirement accrual (up $521); Albert Green, director, $1,000 director's fees; Edmund M. Hanrahan, director, $1,000 director's fees (down $800); Francis Hartley, Jr., director, $1,000 director's fees (down $700); A. Charles Schwartz, director, $900 director's fees (down $700); Joseph V. Schields, director, $1,000 director's fees (down $800).

Sullivan, Donovan, Hanrahan, McGovern and Lane, legal fees as general counsel, $30,000, and $32,500 for additional services rendered for years 1953, 1954, and 1955; Frederic P. Kimball, consultant, $12,450; Arthur Young and Company, public accountants, $10,500.

CONTINENTAL AIR LINES, INC. Robert F. Six, president and director, $40,000 salary (up $5,000); Louis H. Mueller, chairman of the board of directors, $600 bonus and indirect compensation; Lawrence C. Ames, director, $600 bonus and indirect compensation; Sheldon G. Cooper, director, no compensation; F. L. Ehrman, director, $200 bonus and indirect compensation; Marco F. Hellman, director, $400 bonus and indirect compensation; J. G. Holland, director, $400 bonus and indirect compensation; Frank H. Ricketson, Jr., director, $300 bonus and indirect compensation; Thomas Roberts, director, $100 bonus and indirect compensation; Robert J. Smith, director, $200 bonus and indirect compensation; Joseph A. Uhl, vice president, treasurer and director, $18,500 salary (up $1,500); C. C. West, Jr., vice president and director, $22,500 salary (up $3,000); O. R. Haueter, vice president-operations, $22,000 salary (up $1,500); Lynn H. Dennis, vice president-flight service, $12,356 salary (up $856); C. Edward Leasure, legal services, $17,500 (up $4,500); Holland and Hart, legal services, $19,000 (up $2,000).

DELTA AIR LINES, INC. C. E. Woolman, president, general manger and director, $54,537 salary (up $6,537); Laigh C. Parker, vice president-traffic and sales and director, $28,621 salary (up $3,621); Charles H. Dolson, vice president-operations, $28,038 salary (up $4,038); Todd G. Cole, vice president-finance and assistant secretary $24,204 salary (up $5,537.32); R. S. Maurer, vice president-legal and director, $20,288 salary (up $2,954.64); W. T. Beebe, vice president-personnel, $18,737 salary (up $2,937); Earl Cocke, Jr., vice president-civic affairs, $18,587 salary (up $2,787); T. M. Miller, assistant vice president-traffic and sales, $18,587 salary (up $2,787); R. H. Wharton, assistant vice president, personnel, $11,371 salary; Carl H. McHenry, secretary treasurer and director, $1,338 salary (up $138); Catherine Fitzgerald, assistant treasurer, $6,513 salary (up $813); R. W. Freeman, chairman of the board and director, $1,338 salary (up $1,096.24); Pogue and Neal, legal fees and services, $76,716 (up $42,886); Arthur Anderson and Co., auditing, tax and special services $13,775 (down $950); Powell, Goldstein and Murphy, legal fees and services, $11,500.

EASTERN AIR LINES, INC. E. V. Rickenbacker, chairman of the board, general manager and director, $50,000 salary and $12,859 bonus and indirect compensation (down $1,150.24); T. F. Armstrong, president and director, $35,000 salary and $5,558.49 bonus and indirect compensation (up $13,752); P. H. Brattain, first vice president and director, $32,500 salary (up $500) and $7,598 bonus and indirect compensation (up $231.45); S. L. Shannon, senior vice president and director, $30,000 salary and $5,385.96 bonus and indirect compensation (up $224.48); L. P. Arnold, vice president, $22,500 salary and $3,969.53 bonus and indirect compensation (up $157.47); J. H. Brock, vice president, $20,000 salary and $2,648.03 bonus and indirect compensation (up $73.22); M. M. Frost, vice president, $27,500 salary and $3,404.33 bonus and indirect compensation (up $135.76); C. Froesch, vice president, $15,000 salary and $2,711.95 bonus and indirect compensation (up $81.52); W. Van Dusen, vice president, $20,000 salary and $2,156.86 bonus and indirect compensation (up $253.64).

Robert Ramspeck, vice president, $20,000 salary; W. L. Morrisette, vice president, $17,500 salary and $1,141.67 bonus and indirect compensation; G. A. Smith, second vice president, $6,666.70 salary (elected 9-1-55); T. E. Creighton, treasurer, $17,500 salary and $2,102.05 bonus and indirect compensation (up $40.65); F. L. Farley, secretary, $15,000 salary and $1,566.57 bonus and indirect compensation (up $41.67); J. C. Warlick, assistant secretary, $8,881.76 salary and $805.25 bonus and indirect compensation; J. K. Kilcarr, assistant treasurer, $10,250 salary and $602.10 bonus and indirect compensation.

E. R. Cook, director, $200 bonus and indirect compensation (down $100); M. Davis, director, $300 bonus and indirect compensation (down $100); G. B. Howell, director, $400 bonus and indirect compensation (down $100); H. Knowlton, director, $700 bonus and indirect compensation (up $100); G. M. McCarthy, director, no compensation; W. L. Moore, director, $800 bonus and indirect compensation; S. Peabody, Jr., director, $600 bonus and indirect compensation; P. E. Reinhold, director, $400 bonus and indirect compensation; L. S. Rockefeller, director, $700 bonus and indirect compensation; McGregor Smith, director, $600 bonus and indirect compensation.

Gambrell, Harlan, Russell Moye and Richardson, legal services, $187,000; Dewey, Ballentine, Bushby, Palmer and Wood, legal services, $60,000; Price Waterhouse and Company, auditing services, $24,000; H. O. Lyon, consultant, $12,000.

NORTHEAST AIRLINES, INC. Paul F. Collins, chairman of the board, no compensation; George E. Gardner, president and director, $24,000 salary and $5,000 bonus and indirect compensation; A. A. Lane, vice president-operations, $15,000 salary and $1,500 bonus and indirect compensation; R. L. Turner, vice president-sales, $15,000 salary and $3,000 bonus and indirect compensation; D. W. H. MacKinnon, vice president-engineering and maintenance, $12,000 salary and $1,500 bonus and indirect compensation (up $500); Hamilton Heard, treasurer, $15,000 salary and $1,500 bonus and indirect compensation; G. E. Reed, assistant treasurer, $8,700 salary and $250 bonus and indirect compensation.

Foley, Hoag and Eliot, general counsel, $52,600; Lybrand, Ross Bros. and Montgomery, auditors, $15,390.

WESTERN AIRLINES, INC. T. C. Drinkwater, president and director, $60,000 salary (up $5,000) and $600 director's fees; S. R. Shatto, vice president-operations and director, $33,000 salary (up $3,000) and $600 director's fees; N. W. Landes, vice president-service and director, $27,500 salary (up $2,500) and $600 director's fees; P. E. Sullivan, vice president-administrative and secretary, $27,500 salary; A. F. Kelly, vice president-sales, $27,500 salary (up $2,500); J. J. Taylor, vice president and treasurer, $27,500 salary (up $2,500); D. P. Renda, vice president-legal, $27,500 salary (up $3,076); G. G. Brooder, vice president, $5,000 salary; C. J. J. Cox, controller and assistant treasurer, $17,600 salary (up $1,600); E. H. Brown, assistant secretary and director of personnel, $10,560 salary.

Hugh W. Derling, director, $550 director's fees (down $150); Robert E. Driscoll, director, $600 director's fees (down $50); Hector C. Haight, director, $600 director's fees (down $100); Donald H. McLaughlin, director, $600 director's fees; L. Welch Pogue, director, $500 director's fees (down $200); Joseph F. Ringland, director, $600 director's fees (down $50); John W. Tempieton, director, $200 director's fees; Harry J. Volk, director, $600 director's fees (down $100); John M. Wallace, director, $300 director's fees (down $250); Alexander Warden, director, $600 director's fees (down $100); Sidney F. Woodbury, director, $450 director's fees (down $250).

CAB ORDERS

(April 12-18)

GRANTED:

Southwest Airways authority to serve Paso Robles-San Luis Obispo, Calif., through Paso Robles Airport.

Flying Tiger Line an exemption to perform transatlantic charter flights for the Commerce Social Club, the Harvard Glee Club, the Internal Revenue Athletic Assn., the State-USIA Recreation Assn., the Department of Labor Recreation Assn. and the Federation of American Societies for Experimental Biology, with certain conditions.

Permission to intervene in the Phoenix Service Case to the City of Durango, Colo., the County of La Plata and the Durango Chamber of Commerce.

B. N. P. Airways a foreign air carrier permit to operate service of a casual, occasional or infrequent nature between Vancouver, British Columbia, and points in the United States, for three years.

Permission to intervene in the Phoenix Service Case to Cedar City, Utah, and Cedar City Chamber of Commerce.

Trans Caribbean Airways an exemption to perform a round-trip charter flight between New York and Europe for the Immigration and Naturalization Service.

Commonwealth of Puerto Rico permission to intervene in the case involving Pan American World Airways' application for new routes between the United States, the Middle East and India.

Permission to intervene in the Fort Worth Service Investigation to the Cities of Arlington and Grand Prairie, Texas, and their Chambers of Commerce.

Trans-Texas Airways exemption authority to serve Waco and Temple on Segment 7 as alternate intermediate points to College Station-Bryan for one year. College Station-Bryan must be served with at least one round-trip flight a day, and flights serving Waco and Temple cannot serve College Station-Bryan.

Permission to intervene in the Quad Cities-Twin Cities Case to Braniff Airways, Northwest Airlines, United Air Lines, Western Air Lines, Davenport, Iowa; Davenport

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Chula Vista and Riverside, California and Winder, Georgia

Chamber of Commerce and Scott County Board of Supervisors; State of Illinois Department of Aeronautics; Minneapolis-St. Paul Airports Commission, and State of Minnesota. Other petitions were denied.

Permission to intervene in the Phoenix Service Case to the City of St. George, Utah. Petition of the Greater Des Moines Chamber of Commerce was denied.

Riddle Airlines an exemption to carry a reporter for the Jacksonville Journal between Jacksonville and New York for news purposes, providing Riddle collects a round-trip fare of $68.80.

APPROVED:

Agreements involving American Airlines, Delta Air Lines and various other carriers relating to intercarrier arrangements.

ORDERED:

Applications of the City of Winner, S. D., and the Winner Chamber of Commerce; the City of Valentine, Neb.; the City of Estherville, Iowa, and the Estherville Chamber of Commerce; and the City of Imperial, Neb., consolidated for hearing with the Seven States Area Investigation.

Braniff Airways' certificate amended to remove a restriction which prohibited the carrier from operating nonstop between Tulsa and Houston.

Investigation to determine whether Braniff Airways should continue to serve Mitchell, S. D., Yankton, S. D., Norfolk, Neb., and Worthington, Minn., and provide service between Sioux Falls, S. D., and Fargo, N. D., via Watertown and Brookings, until 60 days after a decision in the Seven States Area Case.

Piedmont Airlines' certificate amended to eliminate the Charleston-Columbus segment, and Eastern Air Lines' certificate amended to eliminate the Charlotte-Detroit segment. Both amendments comply with terms of a recent court decision, and the carriers have exemption authority to operate the routes until case is settled.

Roland F. Beers, Inc.'s authority to conduct airborne geophysical surveys in certain states extended to May 12, 1956.

Investigation to determine whether Western Air Lines' certificate should be amended to require that San Bernardino and Las Vegas be served only on flights operated via Los Angeles. Investigation was consolidated with Bonanza Renewal Case.

Wien Alaska Airlines' final mail rate order amended to make the rates subject to the CAB investigation of relation to subsidy of capital gains on equipment sales.

DISMISSED:

Trans World Airlines and United Air Lines' complaints against American Airlines' proposal to operate a domestic coach service with DC-7 equipment dismissed as far as suspension of the tariff provisions is concerned. Action on the investigation requested was deferred.

Braniff Airways' application for a Houston and San Francisco route.

DENIED:

United Air Lines' permission to serve Salinas, Calif., through Monterey Peninsula Airport until United convinces the Board that use of the airport would not adversely affect the public interest.

COCKPIT VIEWPOINT

By Capt. R. C. Robson

Trapped in the Approach-Light Bog

(Part II)

Ever dive a DC-6 into a black hole? This refers, of course, to the lack of visual guidance received from ordinary edge of runway lights and the resultant blackness of the runway. Even at Newark, where the instrument runway has twice as much light as any other in the U. S., the inadequacy exists.

To understand the reason for this inadequacy, some knowledge of the human eye is needed.

In the center of the retina, there is a small depression in which retinal tissues are non-existent and cones are exposed to light. This is the fovea. In the remaining retinal area, light must penetrate the 10 layers of tissue that make up the retina before reaching the rods and cones.

This means that the normal eye has a central area of vision that is sharp and clear (foveal vision which represents approximately 5% of the field of vision) and does most of the "seeing." Vision deteriorates rapidly in the remaining area to practically nothing at the extreme edge. In normal vision, both eyes track simultaneously and each eye focuses exactly on the same point.

Why is this important to a discussion of landings?

Shortly before passing the runway threshold (after he is sure he will cross it at a safe altitude), a pilot's eyes go into a condition known as the stare period. That is, the eye is focused on infinity and held motionless. The primary (foreal) visual attention, because of speed, must be ahead. Information received from the parafoveal vision (which is outside the five-degree limit) is strictly of minor importance. In short, the reason for the black hole is that the landing eye cannot see the edge of runway lighting.

It will be found by plotting this foveal cone area that the eye can see only an area twice as wide as the eye is high. Therefore, when crossing the runway threshold at an altitude of 40 feet, anything more than 40 feet to either side of the line of forward vision (a total of 80 feet) is outside the limits of foveal stare vision and quite useless for landing.

As the aircraft sinks to a landing height from the threshold, the runway edge as determined by the lights appears to move upward and outward. Side lighting now becomes even more useless. Both eyes are fixed upon infinity. With good RVR (runway visual range), the lights further down the runway converge into the five-degree foveal area.

But visibility may fall low enough to cut off this point. On a 200-ft.-wide runway, a RVR below 1,900 feet places the angular spread between edge lights at a little more than five degrees. Under this condition, the eye is staring into a void which furnishes no guidance whatsoever.

An indication of how valuable the runway geometric picture is to the pilot is proven by the fact that 99% of the tire marks are found in an area 45 feet to either side of the runway centerline. In bad visibility, there is no familiar geometric pattern—only a black hole. How can we fill in the hole with surface plane definition?

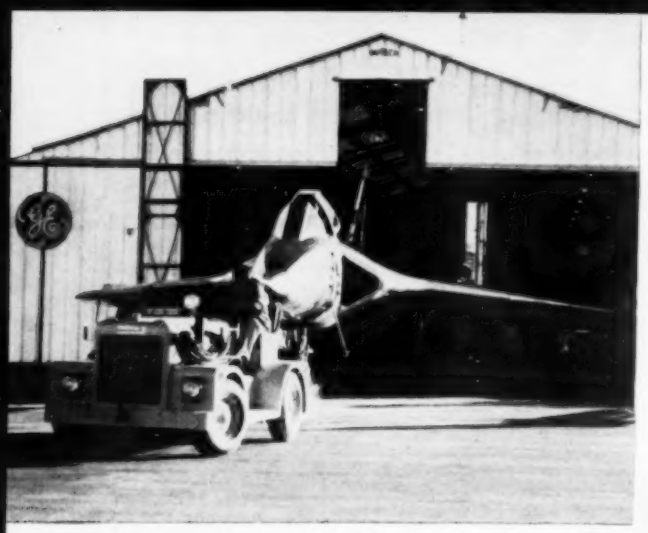
Most likely by use of a double row of "narrow gage" lights flush mounted in the runway surface. These should be spaced 30 feet on either side of the centerline for a distance of 3,000 feet down the runway. Such lights are already in use at some airports in Europe and are available in the U. S.

As the centerline lights in the approach zone provide a positive indication of the flight path, twin-row runway lights provide adequate guidance down the runway. The rows are close enough together to be within the field of foveal vision yet the break in centerline information from positive to negative leaves no doubt that this is the runway.

GENERAL ELECTRIC ANNOUNCES . . .

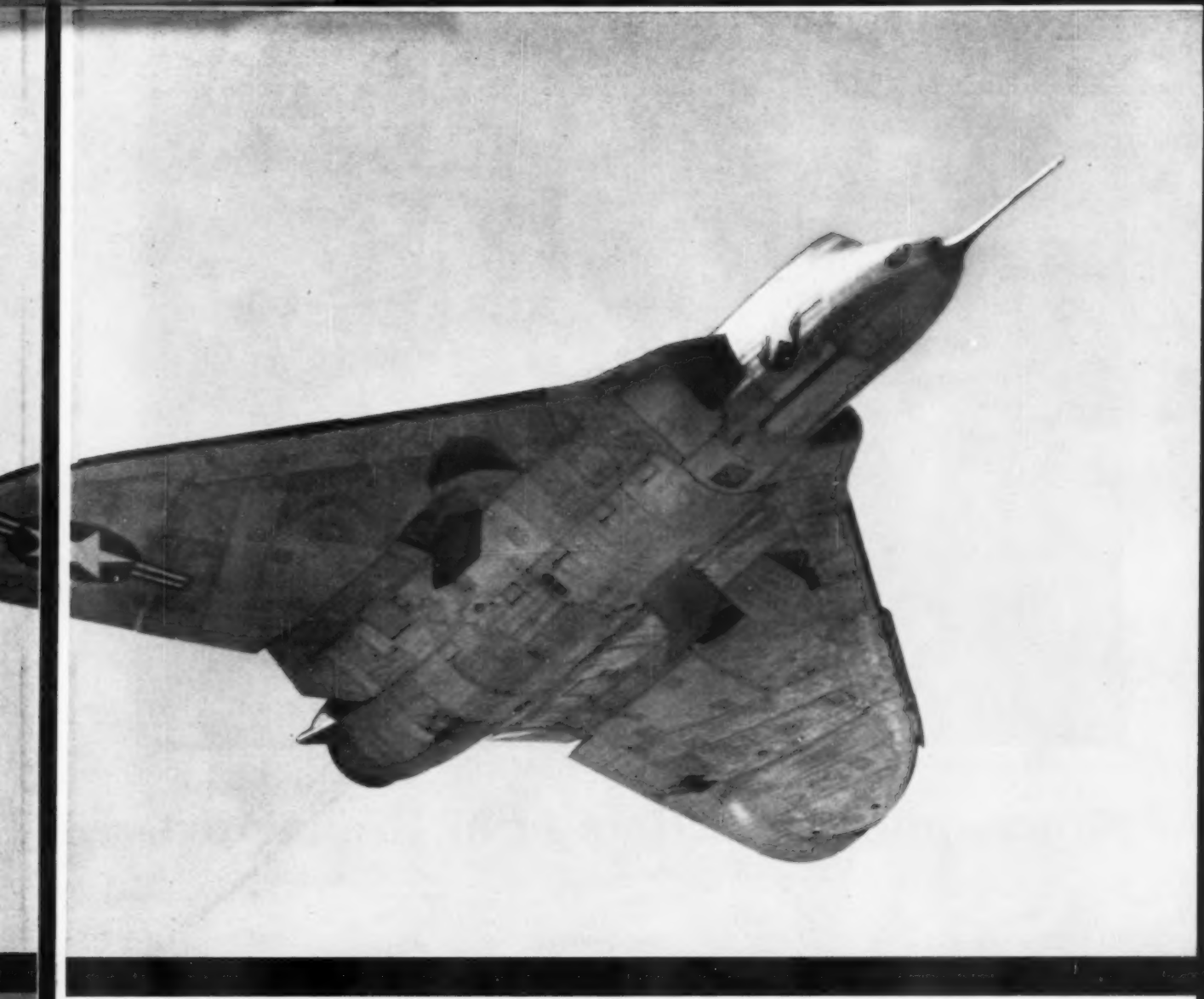
NEW J79 ENGINE FLIGHT-TESTED IN DOUGLAS XF4D

Designed for more thrust per pound of weight than any previous G-E engine, G.E.'s J79 has first flight in single-engine aircraft



PRE-FLIGHT ROLL-OUT. Navy's Douglas XF4D was selected by the Air Force and General Electric as ideally suited for J79 tests—proof of the close co-operation between Armed Services and industry on this vital jet engine project.

G-E TEST PILOT, Roy Pryor, checks XF4D cockpit instrumentation. During test flights at Edwards AFB, engine's stresses were measured by special telemetering equipment on the ground. Pryor was notified by radio of the test results.



Already the XF4D tests at Edwards AFB, California, have proved what many in the industry have known for months. The J79—General Electric's latest and finest jet engine—can develop more lbs of thrust per lb of engine weight than any previous turbojet developed by G.E.

"It was like having a tiger by the tail," said Roy Pryor, G-E test pilot, after he first flew the J79 in an XF4D last December. The J79's efficiency, light weight, and high thrust output made possible outstanding performance during military power climbs, level flight runs—plus throttle bursts during descent.

The joint Air Force-General Electric tests at Edwards are only a prelude to hotter J79 flights to come. But they mark a significant "first" in the aircraft powerplant field.

Never before has a new American jet engine been flight-tested in a single-engine aircraft before initial delivery to airframe companies. The firms now building new planes which will use the J79, will get an engine with actual flight experience in a military aircraft . . . rather than an engine with only factory or flying test bed experience.

Today, over 35,000 G-E J47's power more Air Force planes than any other jet engine. The new J79 with its extremely advanced design and performance features, represents still another potent G-E addition to U.S. airpower. General Electric Company, Cincinnati 15, Ohio. 235-5

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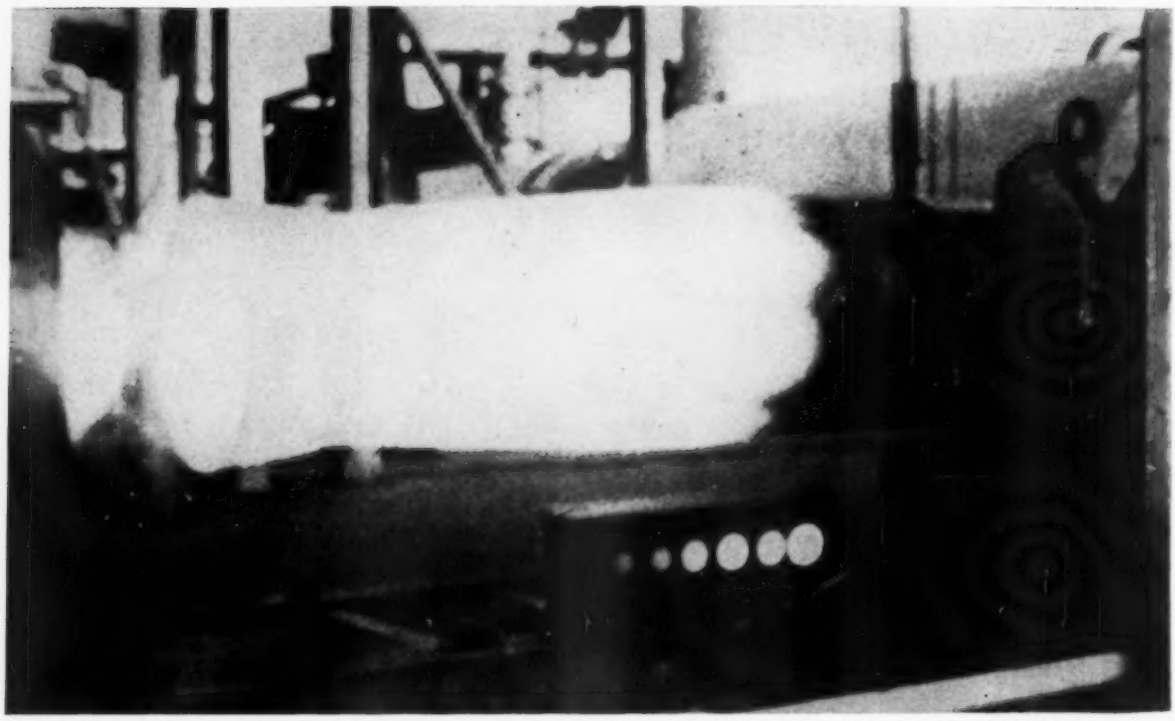


MARQUARDT RAMJET'S TAILPIPE glows white hot at peak of test run. Weighing 500 lb., engine produces high thrust.

Supersonic 28-In. Ramjet in Production

By Irving Stone

Van Nuys, Calif.—A 28-in. diameter supersonic ramjet engine developed by Marquardt Aircraft Co. has become the Air Force's first such production powerplant.

The engine weighs just under 500 lb.; it produces thrust equivalent to 50,000 hp. under typical flight conditions, the company says. For speeds in the Mach 2.5 to Mach 3 range, this would be equivalent to an engine thrust rating approximating 10,000 lb.

The new ramjet is the first in a series of these supersonic engines which Marquardt has under development or in preliminary design stages.

Marquardt's experience with ramjet powerplants is among the most extensive in the industry. Early subsonic engines developed by the company powered missiles, drones and piloted aircraft in a variety of installations. One of these engines was a 30-in. diameter unit, test-flown under a Douglas B-26 used as a flying test-stand.

While the company will make no identification of specific ramjets for specific missiles, it is known that their engines have powered the Boeing Bomarc and Lockheed X-7 supersonic test vehicles.

Thus in about one decade, the ramjet has progressed from a relatively crude powerplant to a refined, flight-proven supersonic engine. Today the ramjet is demonstrating its operational reliability in missile flight at high Mach numbers.

Single-Shock Inlet

Marquardt's 28-in. ramjet has a 50-deg. single-shock conical inlet spike and a sharp-edged inlet cowl. The relative position of the spike and the cowl inlet lip is extremely critical to efficient engine operation. This requires precision manufacture and assembly of the spike and the cowl.

Aft of the inlet is the diffuser assembly, whose length has been kept to a minimum to limit the length of the engine and keep weight down. The diffuser consists of a double-wall monocoque shell, which is the backbone of the engine. It is an efficient load-carrying structure on which other main engine components are hung.

Between inner and outer skins the diffuser shell accommodates plumbing and electrical wiring and also serves as a duct for the discharge air from a turbine-driven fuel pump.

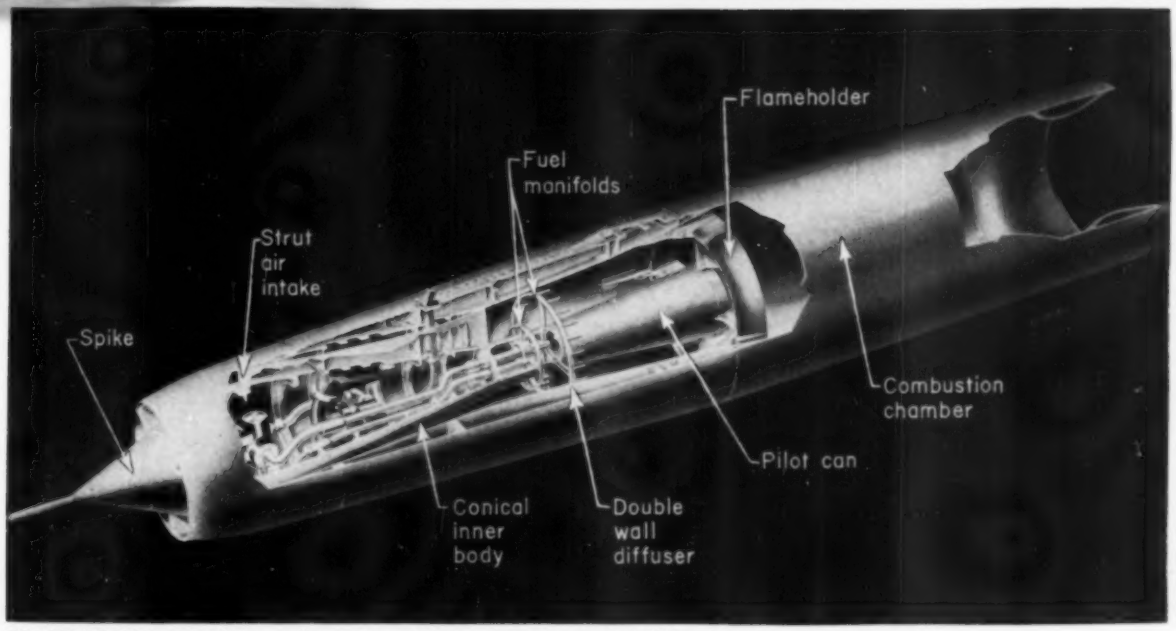
Internal Systems

Housed in the forward portion of the diffuser is a conical inner body, supported by three struts, which contains the fuel system and controls. The conical shape of the inner body serves as a controlling medium for the rate of diffusion of air passing into the combustion zone aft of the diffuser.

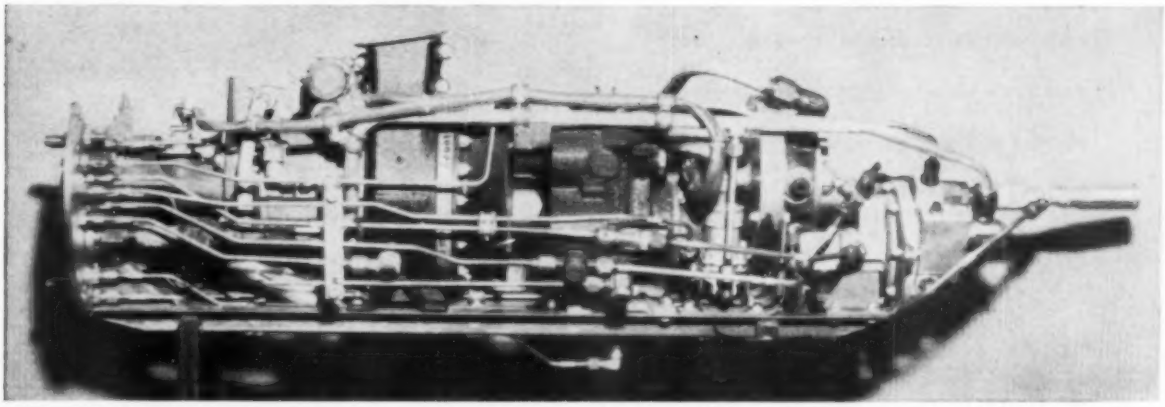
One of the diffuser support struts takes in, at its leading edge, ram air for powering the turbine driving the fuel pump. The aft portion of this same strut serves as a passageway to lead the turbine discharge air to the double wall of the diffuser, where it is discharged overboard.

The two remaining struts carry plumbing and wiring from the diffuser shell to the fuel control system in the inner body.

The fuel control system primarily is

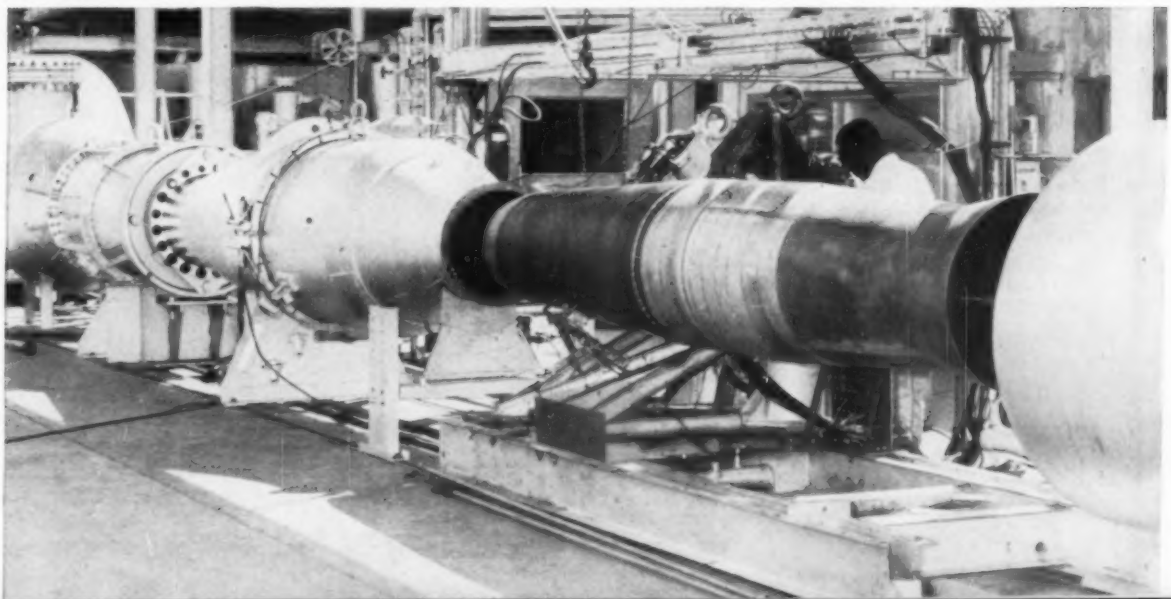


CONSTRUCTION DETAILS are shown in artist's drawing of a typical 28-in. diameter supersonic ramjet.



FUEL AND CONTROL SYSTEM is housed in the forward section of the conical shaped diffuser.

SUPERSONIC RAMJET set up in a stand for tests. Convergent-divergent nozzle is visible at right end of engine.



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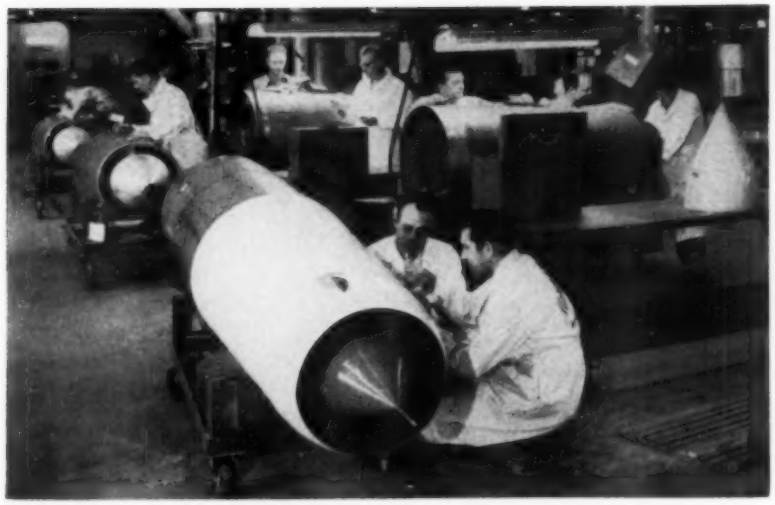


FINAL STATION on Marquardt's supersonic ramjet production line.

pneumatically regulated. Sensing pick-ups are located in the inlet and diffuser to provide command signals to the fuel flow regulator.

The regulator is adjustable to supply fuel to maintain a predetermined Mach number, within limits, throughout the entire flight trajectory of the missile. The regulator can be adjusted for a prescribed flight trajectory to assure that the flow to the combustor does not exceed the fuel-air ratio limitations imposed by the combustor geometry.

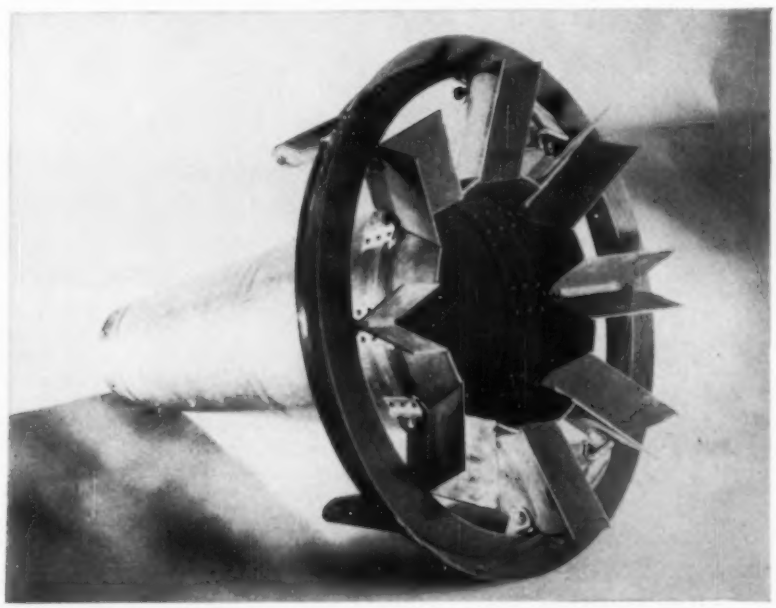
The entire fuel control system is designed as a package unit to slide into the inner body on rails. Thus it may be withdrawn for easy serviceability during ground checkout.

Fuel control package units may be interchanged to best suit the launch requirements of the missile the ramjet powers. One control package may be for a short-duration boost application, as in the case of an air-to-air missile. Another control package may be designed for long-duration boost, say 45 sec., as in the case of a ground-to-air missile.

Flow Control

Located at the aft end of the inner body is an aerodynamic flow control device designed to produce smooth and uniform airflow past the fuel injector and into the combustion chamber. Use of this device has led to substantial improvement in diffuser design.

Immediately downstream of this flow control device, about midway in



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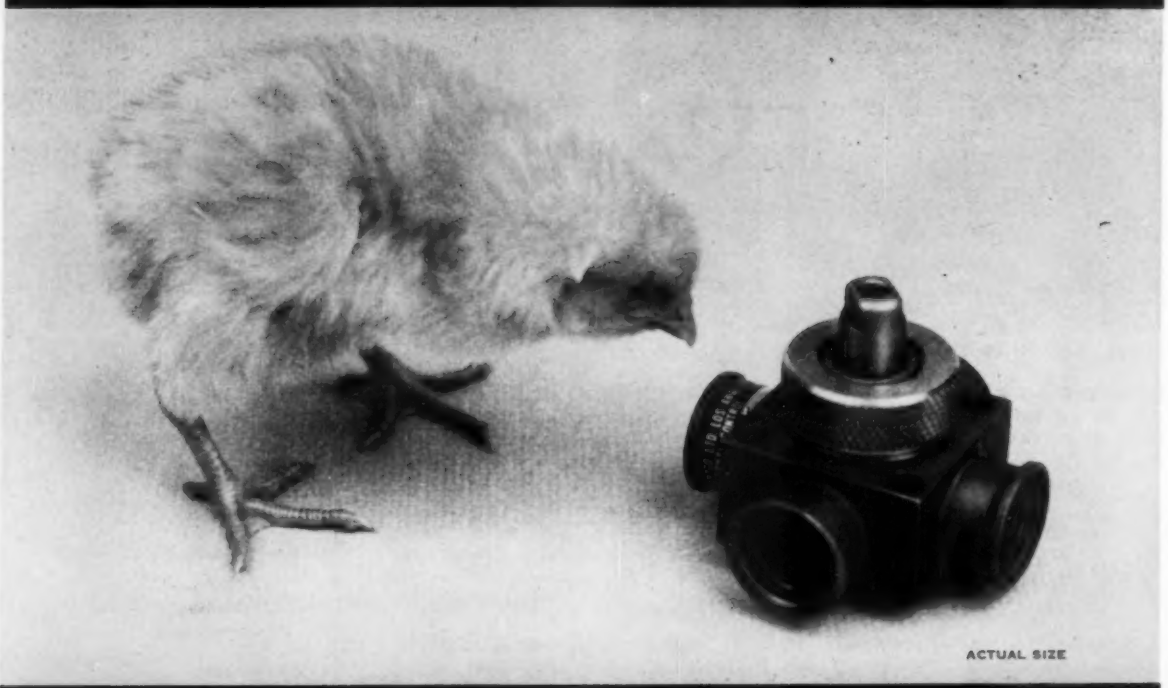

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Here — in this tiny stainless steel envelope weighing but four-tenths of a pound — is a minute valve in which over 90 combinations of operating characteristics can be provided. Flow patterns are available in four-way, three-position; three-way, three-position; or three-way, two-position.

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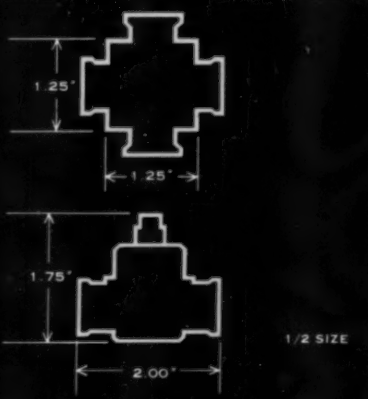
Certain standard versions are now being stocked as shelf items. Ask your Whittaker Field Engineer about them.



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the diffuser, is located the fuel injector. This unit is comprised of two annular concentric rings separately manifolded so that fuel can be directed through the inner ring during cruise operation and through both rings when maximum thrust is required.

Numerous spray nozzles on the rings force fuel into the air passing through the diffuser upstream of the flameholder.

Located at the aft end of the diffuser, the flameholder consists of a conical pilot can connected to an annular V-gutter by struts of V-gutter configuration. The complete flameholder assembly is attached to the diffuser inner skin by four brackets.

Forward portion of the pilot can contains two short-duration ignition flares which are electrically fired to initiate burning. Flame from the flares is directed through a baffle centrally located in the pilot can. The flame is propagated outward from the baffle to the end of the can and the flameholder V-gutters for steady burning.

Aft of the flameholder, and fastened to the end of the diffuser, is the combustion chamber. This unit is designed for minimum external drag and maximum combustion efficiency.

At the aft end of the combustion chamber is a convergent-divergent exit nozzle. Diameter at the throat of the exit nozzle is sized as a function of the inlet geometry of the engine.

New Alloys

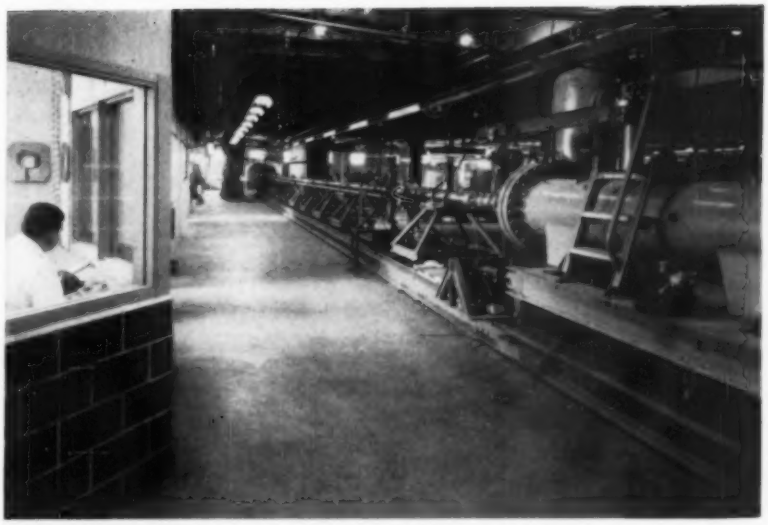
Material used from the inlet to the combustion chamber is predominantly aluminum alloy. Flameholder and combustion chamber are fabricated from high-temperature stainless steels suitable for service temperatures of 2,000F.

In advanced engines that Marquardt has under development, many new alloys are being used forward of the combustion chamber. These include magnesium-thorium-zirconium HK31, the A-110AT titanium alloy, and the heat-treatable 6Al-4V titanium alloy.

Heavy aluminum oxide ceramic coatings are being used to line combustion chambers for thermal insulation. Use of this material allows increased combustion temperatures or, alternately, the use of less critical material for the combustor shell.

Marquardt engineers see substantial improvement in power which can be developed from ramjets of reasonable size. Specific design areas currently under consideration for overall improvement in engine performance include inlet, controls, flameholder and exit nozzle.

Marquardt currently is investigating special fuels for ramjets through independent research and in conjunction with the OMAR program, which involves Olin Mathieson Chemical Corp., Marquardt and Reaction Motors, Inc.



AVCO TEST ENGINEER controls "firing" in 100-ft. long shock tube.

Avco Uses Shock Tubes to Study Re-Entry Problem For ICBM Nose

Studies of the re-entry problem for hypersonic missiles are being conducted in shock tubes at the research laboratory of Avco Manufacturing Corp., one of the two sources for ICBM nose cones.

Speeds approaching Mach 25 have been simulated in the tubes, accompanied by temperatures as high as 15,000F. These extremes of speed and temperature are reached only for a few millionths of a second.

One of the shock tubes is 100 ft. long and is believed to be the world's largest. This research, sponsored by the Air Force, parallels other shock tube work on a different scale at the National Advisory Committee for Aeronautics and Cornell Aeronautical Laboratory.

Shock Tube Function

The major value of the shock tube derives from the problems of developing hypersonic speeds in a conventional wind tunnel. The expansion of the working medium—generally air—through the supersonic nozzle of a wind tunnel causes a drop in temperature.

At speeds above the Mach 5 range, this temperature drop is enough to condense the moisture from the air and nullify the results of the test by bathing the model in a shroud of wet gas.

The conventional method of countering this is to heat the air upstream of the nozzle, but the heating requirements to avoid condensation and liquefaction are too high for the materials of the tunnel.

The shock tube gets around this by generating its intense temperatures only momentarily. The resultant shock wave roars down the length of the tube in a fraction of a second and passes the model under test in a matter of a few-millionths of a second.

Electronic instrumentation is the only possible way to get data during the test run; this is why the shock tube has had to wait for relatively recent acceptance as an aerodynamic tool, even though it was invented just before the turn of the century.

Shock Tube Operation

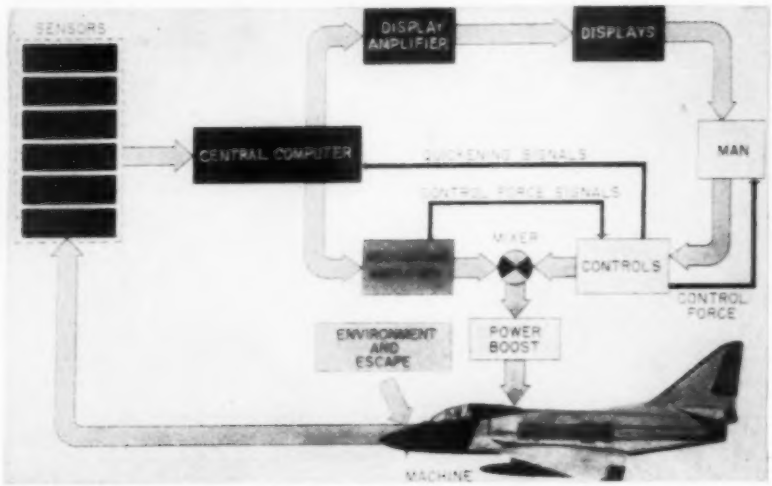
The shock tube is divided into two sections by a frangible diaphragm which has been scored to fail along a predetermined pattern. One side of the tube is pumped to a high pressure.

The tube is fired by breaking the diaphragm, either by firing an explosive mixture of gases or by increasing the driving pressure.

The high-pressure air rushing into the low-pressure chamber compresses the low-pressure air which can't get out of the way in time. A strong shock wave is formed and races down the tube ahead of the pressure front.

Compression of the air just ahead of the shock wave produces a pocket of high-temperature gas, if the shock wave has far enough to travel. This is the major reason for the length of the Avco tube.

Shock tube research at the Avco Research Laboratory is under the direction of Dr. Arthur Kantrowitz, a leader in the field of gas dynamics.



CONCEPT OF FLIGHT SYSTEM integration drawn by Douglas Aircraft.

COCKPIT of Navy pilot capsule.

Navy Integrating Flight System in Pilot

By Russell Hawkes

Chicago—An interchangeable and ejectable nose section capsule bearing the pilot and all sensing, interpreting and communicating organs of a new integrated flight control system has passed a feasibility study by the Office of Naval Research and Douglas Aircraft Co. and is moving into the development phase.

The announcement was made by the leader of the project, Commander George W. Hoover of ONR, climaxing a three-day annual meeting of the Aero Medical Association here.

Leads Russians

The Navy believes that the new integrated flight control system will so increase pilot-and-aircraft efficiency and producibility as to give United States military aviation a substantial edge over the Russians in that respect. Details are highly classified. Hoover said that he expects to see the new integrated flight control system in the next generation of Navy fighters.

The mock-up of the capsule displayed at the Aero Medical Association convention had a variation of the earlier ONR-Douglas developed television-tube-and-educational-toy-presentation that should fly in a T2V jet trainer some time in 1957. Hoover considers this presentation to be relatively complex.

The development of an ejectable escape capsule for the pilot has long been recognized as inevitable. The deceleration of a pilot and an ejection seat of current design after escape at a speed of 1,000 knots would be on the order of 100G—far beyond the capacity of a human being to survive. Airplanes now flying are capable of speeds greater than this.

Streamlined Capsule

An escape capsule with greater mass and better streamlining than a body in an ejection seat could reduce deceleration to within human tolerance and give protection from tumbling, windblast, extreme temperatures and lack of oxygen.

At altitudes outside the atmosphere it would also protect the pilot from the hazards of re-entry including aerodynamic heating.

The standard capsule carrying the weight of the integrated flight control system would do all these things and provide an artificial environment capable of supporting the pilot for considerable periods.

Standard Capsule

Standardization of the capsule for all high-performance aircraft regardless of mission is a key point in the new concept.

The idea is based upon the fact that the flight plan equation is identical for all missions. The only difference between missions is that the magnitudes of certain variables in the equation depend upon the nature of the mission.

The new integrated flight control system computer intended for use in the standard capsule is able to handle the extreme magnitudes of the variables stressed for each type of mission, therefore it is adequate for all missions. ONR argues that if the capsule is adequate for all missions then economy demands that it be installed in all airplanes.

Control Concept

Design philosophy of the integrated flight control system conceives the airplane as an armed, mobile platform directed from one location in space and time to another by a man-machine system.

The system is capable of gathering information, interpreting it, making a decision about the use or relocation of the platform and then executing the decision with the controls of the armed platform.

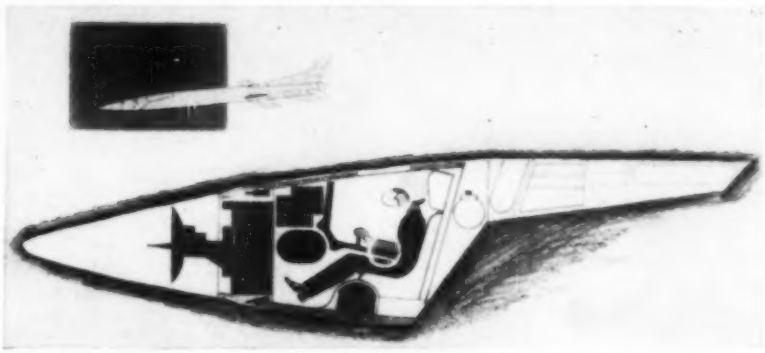
Only man can handle the decision-making function and his psycho-physiological capacities are the only parts of the man-machine system that cannot be adjusted or improved. From this it follows that the machine must be tailored to fit the indispensable, constant pilot.

The machine must supply the man with information in the simplest and clearest form to prevent the time required for understanding from encroaching upon the pilot's precious time for reflection.

Vital to the operation of the man-

SIMPLIFIED flight data presentations.

NAVY'S PILOT CAPSULE demonstrated at Aero Medical Association.



FUTURE CAPSULE will have flush mounted canopy of this sketch.

Capsule

machine combination is a universal computer capable of performing all the technical flight planning and operational chores below the level of decision.

The computer is neither a digital nor an analog type. The Navy will not release a description of the principle upon which it works. It is reported to be light and compact enough to permit the installation of an extra one for emergency use without paying too high a weight penalty.

Hoover said that the state of the art involved in the design of an integrated flight control system and an ejectable escape capsule are sufficiently advanced to permit the development of these systems beyond the point required for airframes now flying. He pointed out that paradoxically the development of these systems is lagging behind airframe development and that consequently the latest generation of American fighters is plagued by dangerous inadequacy of escape and control systems.

Standard Benefits

The standard capsule concept would free these systems from the limitations imposed on the state of the airframe art and permit the man-machine system and the escape machinery to be over-designed to cope with conditions more extreme than any likely to be encountered by a contemporary airframe in which it might be installed.

Hoover said that the standard capsule was not the product of a radical dream but merely the natural meeting of several independent engineering studies at a common solution.

Lines of Effort

The lines of effort that culminated in the man-machine bearing capsule were:

- **Studies of emergency** pilot ejection capsules intended to permit safe escape at supersonic speeds by cutting down the amount and rate of onset of drag induced deceleration of the ejected pilot, by eliminating tumbling and wind blast damage, and by providing the pilot with an artificial environment permitting long term survival.
- **Studies aimed** at reducing the multiplicity of "brain" components i.e. sensors, computers and inter-system communicating devices required to free the pilot from flight planning chores and give him time for tactical decision-making in the limited time available at the speeds anticipated for upcoming military airplanes.
- **Attempts to centralize** the "brain" in a location where environment can be controlled.

Among the additional advantages claimed for the standard capsule are:

- **Low initial cost.** Standardization would reduce the cost of designing and building many comparable devices.
- **Low replacement cost** for destroyed airplanes. The ejectable capsule would save all the expensive equipment installed in the capsule while saving the pilot and far from making the escape more difficult would provide desirable added mass.
- **Low training costs.** Re-training would be unnecessary in converting to a new type aircraft; a two-place version could be developed for training and certain operational purposes; the actual cockpit could be plugged into a simulated training device for flight training on the ground and could even be used at the squadron level to fly a "dress rehearsal" of a specific mission.
- **Elimination of** technical problems for the pilot. Pilot training would be primarily of the war college type as the machine part of the man-machine combination would solve the technical problems.
- **Reduced radiological** contamination of the cockpit area in nuclear powered aircraft.

The capsule cockpit could be hangared at a point distant from the powerplant to prevent contamination on the ground.

Assistant Secretary of Defense Dr. Frank B. Berry opened the three day meeting with a plea for more effort

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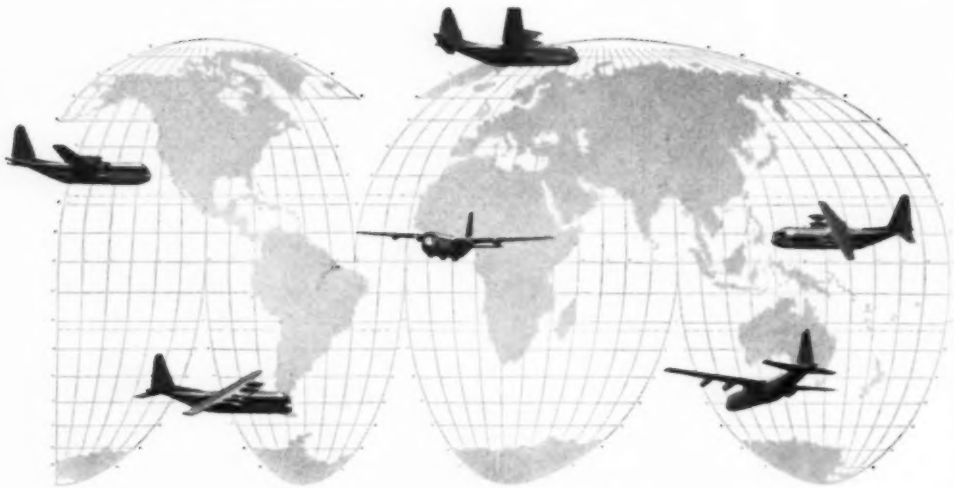

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AN ALL-PURPOSE CARGO, personnel and evacuation transport, the Hercules is now being manufactured in quantity at Air Force Plant No. 6, Marietta, Ga. Initial deliveries are for Tactical Air Command's 18th Air Force.

USAF's C-130 HERCULES

Today America's military services are in the aerial trucking business in a big way transporting men and supplies to bases all over the world.

Their problems and requirements vary. But whether the job is airlifting a division to Japan, airdropping tractors or buildings at Arctic DEWline sites, or rushing missiles and fighter engines to Middle East bases, the need for mobility and versatility has never been so great.

It was for such heavy-duty hauling assignments—*of all kinds*—that America's first propjet combat transport, the Lockheed C-130 Hercules, was designed.

Specifications

Wing span, 132 feet
Length, 95 feet
Gross weight, 124,000 pounds
Cargo payload, 40,000 pounds
Troop capacity,
92 fully-equipped troops
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to solve the pressing problems of health and survival in high altitude, high speed flight.

New Time Relationship

A. M. Mayo, Equipment and Safety Research Engineer for Douglas Aircraft Co., El Segundo, Calif. said that to be practical the consideration of these problems should include factors encountered outside the earth's atmosphere. Among the problems he listed were: crew space design; limitations of vision; extreme temperatures; low ambient pressure; acceleration including zero gravity; noise and vibration; collision with meteors or meteor dust; escape; and high frequency radiation.

Mayo said that the time-distance relationship must be reconsidered. Time must be recognized as a fundamental quantity and distance a subordinate variable.

Human reaction time is fixed and the compression of distances by increasing speed means that certain functions must be turned over to automatic devices if flight is to be controllable.

Highspeed Escape

Most fatal seat ejections have taken place at low altitudes and air speeds and death resulted because of insufficient time and altitude to eject, separate from the seat, and deploy the parachute, according to Lt. Col. John P. Stapp, Chief of the USAF Aero Medical Field Laboratory Holloman AFB, N. M. He suggested that a seat ejection catapult providing enough force to lift the pilot from an airplane standing on the ground to an altitude permitting safe use of the parachute might be developed.

Listing the problems of escape, he said that present ejection equipment has been most effective at subsonic speeds and at altitudes between 1,000 and 30,000 feet.

At altitudes above 30,000 ft. tumbling and spinning are serious hazards. Experiments with human subjects have shown that a spin of 160 rpm. for 12 seconds will produce unconsciousness and that vomiting and disorientation take place at 90 rpm. or less. Rotation at 200 rpm. for two minutes has proved fatal for animal subjects.

Capsule Objections

In supersonic flight in the lower layers of the atmosphere rapid drag induced deceleration is the problem and may be avoided by reduced drag and increased mass. Above 100,000 ft. the problem may be one of re-entry in which case large drag values may be desirable.

The problem of aerodynamic heating also must be considered, if escape equipment is to be adequate.

Stapp saw an objection to the heavy streamlined capsule in the possibility of ejection in a high speed dive at relatively low altitude. In such a case reduced deceleration might not be desirable.

Another objection to the escape capsule was cited by Cmdr. Rolland A. Bosee of the Naval Parachute Unit, El Centro, Cal. He pointed out that in a stabilized forward-facing open ejection seat the impact of the air would pin the occupant to the back of the seat preventing the body from being distorted and organs from being displaced by decelerations. In a capsule the absence of air blast would allow the body to be bent around and bulged between its restraining straps in a manner which might prove dangerous.

Onset Rate Studies

Bosee also described a Navy developed "reefed parachute" which stabilizes the wearer without providing much deceleration until he has reached lower altitudes and speed. Then the reefing line would automatically be cut to permit full deployment.

The much debated relationship of rate of onset to human tolerance of positive loads was explained by a team of researchers from the Aero Medical Laboratory, Wright Air Development Center.

Their study demonstrated that:

- **The reflex action** of the circulatory system may compensate for G loads better than a G-suit if the rate of onset is slow enough to permit the reflex action to take place. Blackout threshold was raised an average of 1.9G by the gradual onset run and 1.6G by the G-suit.
- **In gradual onset run** with a G-suit the threshold was raised 1.5G above the threshold with a G-suit in a rapid onset run.
- **High correlation** between the threshold rise caused by reflex and that caused by the G-suit seems to indicate a possible reflex reaction to the G-suit.
- **Reflex compensation** for G-loads on the circulatory system raises arterial pressure at heart level thus maintaining the flow at eye level.
- **Time required** for the reflex to affect arterial pressure is from six to eight seconds.

The effect of the supine position on tolerance to G loads was considered by Lt. Philip R. Dorman, USNR (MC) the fully supine position was considered impractical because of its limitation on forward vision, therefore the study dealt with 65 deg. of supination. Subjects who had failed to withstand 7G for 30 sec. in the upright position while wearing a G-suit were retested in the supine position without the suit. None of the subjects passed. When

HERE'S A TOUGH PROBLEM OF ACCESSIBILITY

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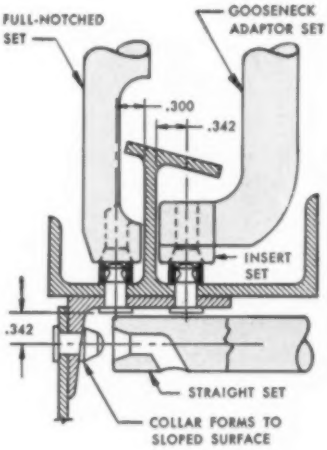

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tested in the supine position with a G-suit all subjects withstood 7G for 30 sec.

Loss of visual acuity under heavy G loads is not caused by the effect upon circulation alone but also by the mechanical effect of the apparent increase in weight of the components of the eye according to William J. White of the Aero Medical Laboratory. White said that preliminary results indicate some loss of visual acuity is probably due to displacement of the crystalline lens of the eye under high G loads. Tests with the subject in the upright, prone and supine positions indicate that the effect takes place regardless of the direction of the G load relative to the body.

The possibility of some other reason for the decrease in acuity such as distortion of the eyeball by hydrostatic effects has not been discounted.

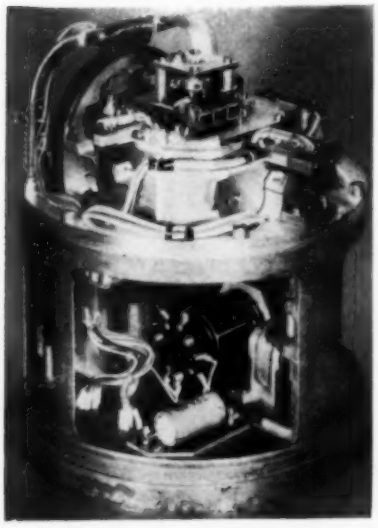
The dangerous effect of relatively low G loads over a long period of time may be receiving too little attention according to Lt. Cmdr. Frank H. Austin USN (MC). Austin pointed out that in a turning flight at high altitude relatively low G loads bring the airplane into contact with the buffet boundary at fairly high speeds. He said that the danger was not from the direct effect of the G load in this condition but from fatigue caused by prolonged finessing flight while avoiding the incipient high speed stall indicated by buffet.

Austin also presented a study carried out on Navy aircraft showing the accelerations encountered in catapult launchings and arrested landings. The study was intended to provide a base line for more advanced studies.

Oxygen Systems

Pressure breathing and diluter demand oxygen systems were criticized by Dr. John R. Pippen. He said that the advantages of the diluter demand system have disappeared at the altitudes now being flown and that pilots now leave the demand regulator set for 100% oxygen. This being the case, the complexity and unreliability of the diluter demand system cannot be accepted. Pressure breathing he called unnatural and fatiguing. In the case of rapid decompression, there was increased danger of tissues being ruptured by the internal pressure. He said that these dangers are not justified by the additional 5,000 ft. of altitude made available by pressure breathing.

In a statistical consideration of the relation of age and experience to aircraft accident frequency, Col. H. G. Mosely, USAF, pointed out that a disproportionately large percentage of accidents involve young pilots. However, he noted an upward curve in the proportional accident frequency figures for older pilots in jet aircraft.



Stable Platform Gyro

This gyro, used as a sensing element for stable platforms used in aerial photo reconnaissance aircraft, features fail-safe caging, high sensitivity and very low drift. Labeled Aeroflex Type ARX-3 vertical gyro, the instruments are manufactured by Aeroflex Laboratories, Inc., 34-06 Skillman Ave., Long Island City 1, N. Y.

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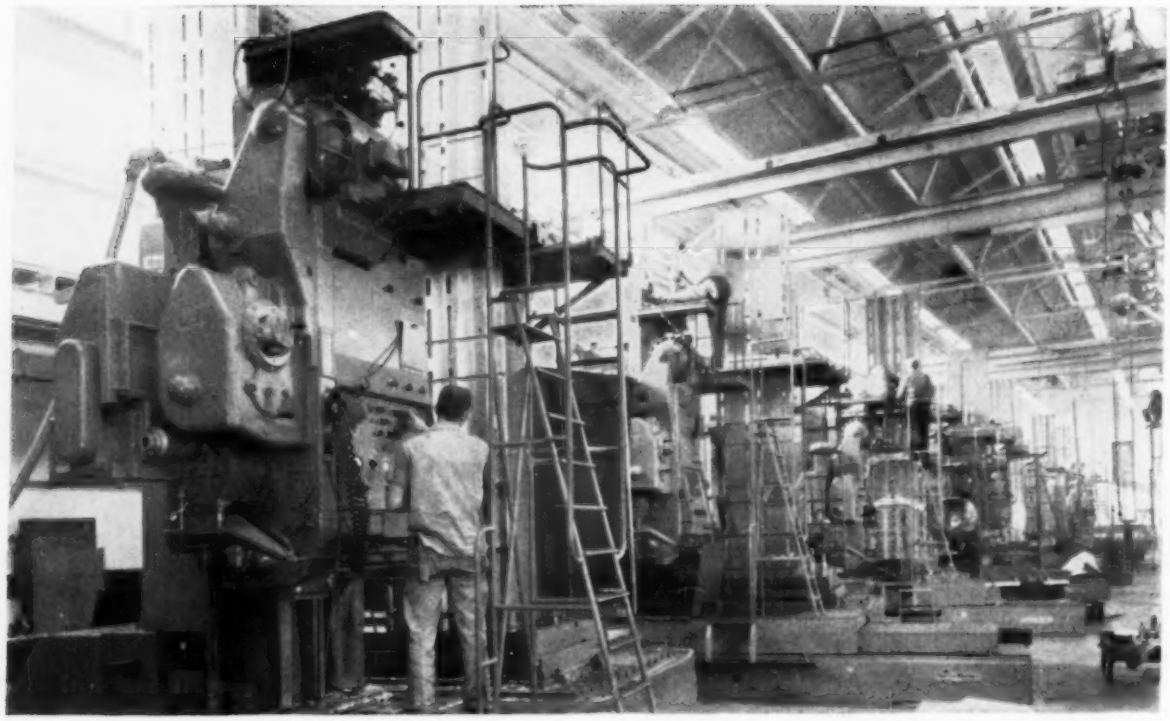
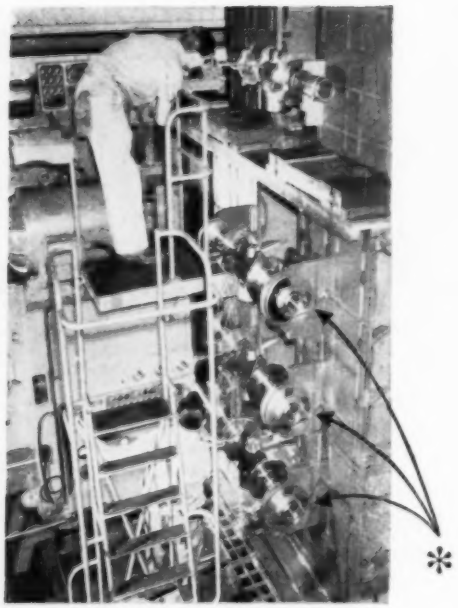


at CPT...A New Kellering



From the pattern at top, three aircraft landing gear axles are Kellered at one time. Axles being machined are indicated by asterisk.

● At CPT, we've installed eight BG-22, 3-spindle Pratt & Whitney Kellering machines. These 8 Kellers added to our single-spindle and two-spindle Kellers give us a total of 10 machines.

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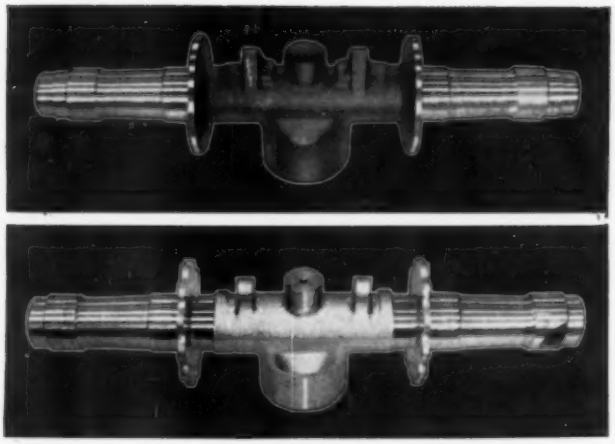
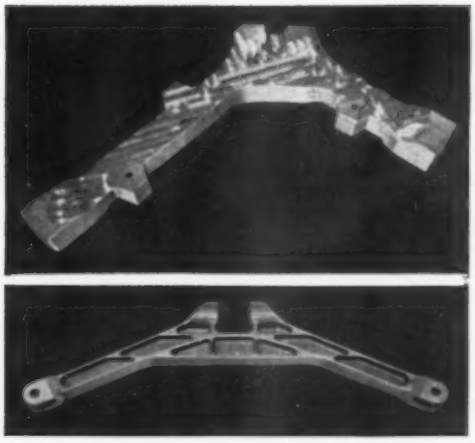


General view of the Kellering Department at CPT, showing the 8 new 3-spindle Kellers.

Top photo shows an aircraft axle before it was Kellered. Bottom photo shows it after Kellering.



This aircraft structural part has been Kellered from a forging similar to the one shown at top.

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The world's largest flash-butt welding machine is also a part of CPT's facilities. Hollow steel sections up to 100 square inches in weld-face area are joined automatically and almost instantaneously.

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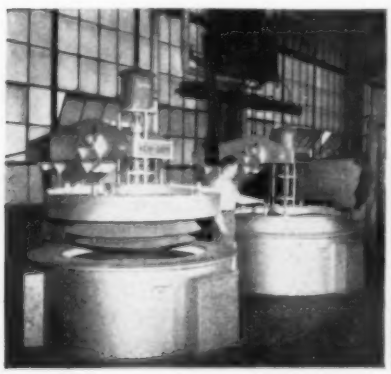
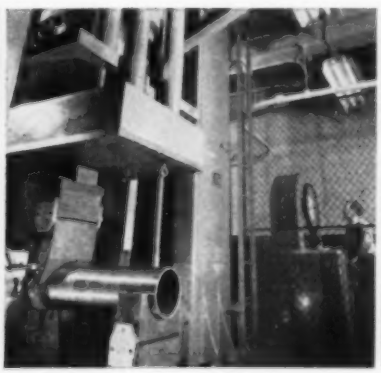
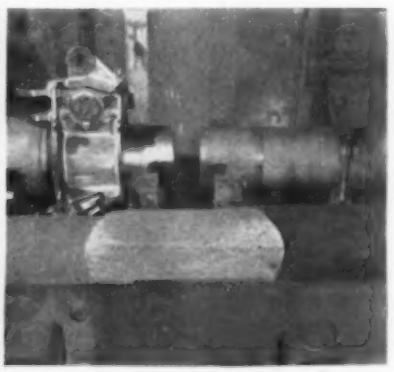


Part of the battery of electric heat-treating furnaces at CPT. Pieces up to 13 feet long can be handled in these furnaces and quench tanks.



CPT's Baldwin-Southwark one-million-pound-capacity tensile testing machine can exert this pressure either in tension or compression.



Kellered head section about to be joined to cylinder tube by resistance welding on CPT's giant flash-butt welder.

Military, Airlines Push Single Sideband

By Philip J. Klass

An old idea, made practicable by new techniques, will double the number of ground-air communications channels now available in the congested high frequency (2 to 30 mc.) band. Called "Single Sideband," or SSB for short, it also will improve intelligibility under adverse conditions and provide a several-fold increase in effective power and range.

Impetus for the switch from present "double sideband," or AM, transmission to the new SSB results from the congestion in the HF band. Both the military and the airlines, particularly the overseas carriers, are hard pressed for HF channels.

Single sideband ground equipment suitable for air-ground communications should be available by mid-1957. Airborne equipment will follow perhaps a year later.

Within five years, partial use of SSB by the Air Force, Navy and with some airlines appears certain.

Collins Radio Co. is developing both ground and airborne SSB equipment which is slated for USAF operational evaluation late this year at the Rome Air Development Center. Radio Corporation of America is working out techniques which will make it possible for the USAF to convert its present ARC-21 transceivers for single sideband operation. The airlines will draw heavily on military financed SSB developments. But their need is so pressing, and SSB is so promising, that they are not waiting for completion of the military programs.

• **Airlines Electronic Engineering Committee** (AEEC) of Aeronautical Radio, Inc., is busy preparing a characteristic (specification) for an airline SSB airborne receiver-transmitter.

• **International Air Transport Assn.** met recently in Montreal to draw up tentative operational requirements for SSB and to consider the problem of compatibility.

SSB
Single Sideband

1 Doubles No. of Channels
2 Increases Effective Power
3 Improves Intelligibility

Compatibility

The IATA meeting devoted considerable attention to the major problem of compatibility. This problem arises because a "pure" single sideband set cannot work the double-sideband (DSB) equipment now in use.

A long transition period usually is required to changeover to a new system, and the switch from DSB to SSB will be no exception. It is also obvious that aircraft cannot afford to carry both DSB and SSB equipments.

For this reason, new SSB equipment must be designed for "bi-mode" operation. That is, it must be able to communicate with aircraft or ground stations equipped either with the present DSB or the new SSB. (For explanation of terminology, see box p. 63.) Fortunately, this is not an insurmountable problem, although it does complicate somewhat the SSB equipment designer's task.

SSB Advantages

Single sideband offers several advantages over the present DSB.

• **Twice as many channels available.** Because voice intelligence is transmitted on only a single sideband, and because of the improved frequency stability inherently required of an SSB system, at least twice as many channels can be obtained from the same radio spectrum as with DSB.

• **Several-fold increase in radiated power.** In a conventional DSB system, approximately two-thirds of a transmitter's power goes into the carrier; the remaining one-third is divided equally between the two sidebands. With a suppressed carrier type SSB system, nearly all of this power goes into the single sideband which carries the useful voice intelligence. Although this theoretical six-fold increase in sideband power is not fully realized, it has been demonstrated that a SSB transmitter rated at 100 watts peak power can match the performance of a conventional 400-watt AM transmitter, J. F. Honey, Stanford Research Institute, told IATA during its Montreal meeting. This increase in effective radiated power without increased power rating, is particularly welcome in view of the somewhat reduced effectiveness of flush-type HF antennas now going into use on high-speed aircraft. The relative advantage of SSB over DSM depends upon the propagation conditions. As conditions deteriorate, SSB's advantage grows, as shown by the curves, p. 64.

• **Improved intelligibility.** In long-distance HF DSB propagation, one sideband may experience a slight phase shift due to multipath transmission. This can cause the delayed sideband to partially cancel the other, producing distortion and loss of intelligibility. Fading or slight phase shift of the carrier can produce similar results. However, with a suppressed-carrier type of SSB, these problems reportedly do not exist, although there are other problems peculiar to single sideband.

Several Types

There are several different types of single sideband systems, but the two which are most likely to see use in military and civil aviation are:

• **Suppressed carrier.** Here the carrier wave of the transmitted signal is suppressed as much as possible at the transmitter (up to perhaps 50 db.). Without a carrier which can be used by the receiver for demodulation, the SSB receiver must contain an extremely accurate and stable reference to generate its own carrier frequency. Similar stability and accuracy requirements are imposed on the transmitter. With such an accurate frequency reference, no "automatic frequency control" (AFC) circuitry is required in the receiver.

• **Controlled carrier.** In this type of SSB, the carrier is suppressed during transmission of voice intelligence, but is transmitted during brief intervals when there is a pause in the voice modulation. It is usually convenient to set carrier power level to maintain constant average power output from the transmitter, both during modulation and carrier transmission. The receiver employs AFC circuits whic hare activated by bursts of carrier power and which function to maintain receiver

Introduction to Single Sideband

During the coming months, airline and military operations people will encounter the new term: single sideband. To provide a background for understanding the new technique, Aviation Week has prepared this thumbnail introduction:

• CARRIER: In conventional radio communications, the "carrier" provides a "highway" for transporting the desired voice intelligence from the transmitter to the receiver and for converting it into usable aural intelligence. The carrier is an oscillating wave of radio energy, whose frequency corresponds to what is nominally called the station's broadcast frequency. (See Fig. A.)

• MODULATION: The technique by which voice intelligence is superimposed on the carrier is called "modulation." The most common type of modulation employed in air-ground communications is called "amplitude modulation," or AM. With AM, the carrier wave's amplitude is caused to change in accordance with variations in the amplitude of the modulating voice or tone. (See Fig. B.) The frequency at which the carrier wave amplitude changes varies in accordance with the frequency of the modulating signal. For example, a 1,000 cycle/sec. modulating tone will cause the carrier wave amplitude to oscillate at a frequency of 1,000 cps (Fig. B.) just half that of 2,000 cps modulation. (Fig. C.)

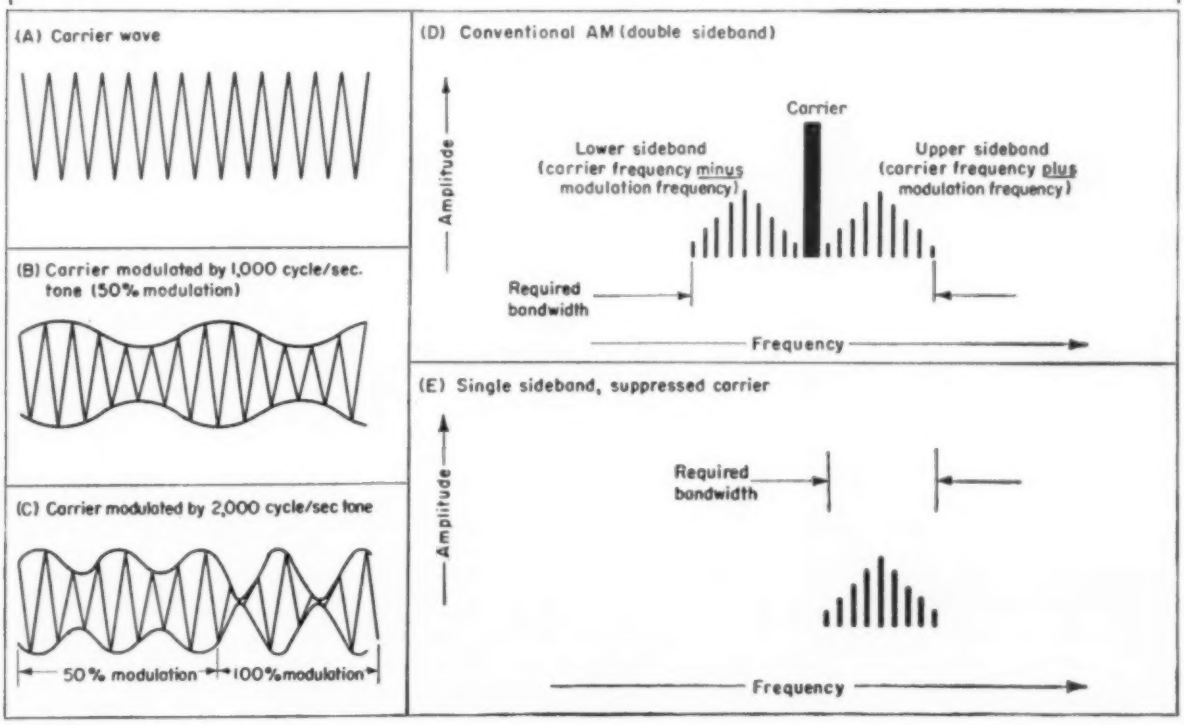
• SIDEBANDS: Modulation of a carrier produces a complex wave consisting of three individual waves: the original carrier, plus two identical "sidebands," which carry the modulation or useful intelligence. (Because AM produces two sidebands, it is sometimes called "double sideband," or DSB.) For example, a 2 mc. carrier (2,000,000 cycles/sec.) modulated by a 2,000 cycle/sec. tone will produce one sideband whose frequency is equal to the carrier frequency minus modulating frequency, or 1,998,000 cycles, and another equal to the carrier plus modulation frequency, or 2,002,000 cycles.

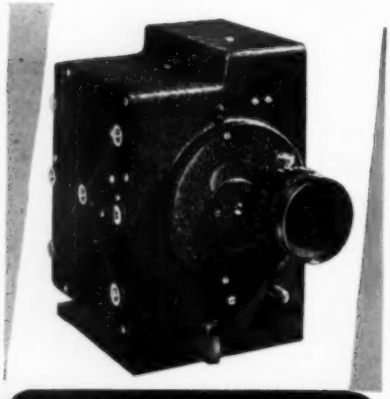
• BANDWIDTH: The amount of radio spectrum required to transmit the desired intelligence is called "bandwidth." For the previously cited example of a 2,000 cycle tone modulation, a bandwidth of approximately 4,000 cycles would be required in conventional DSB to accommodate the two sidebands. For AM voice transmission, a bandwidth of 7,000 cycles, plus an adjoining band on either side to prevent interference from adjacent channels, normally is required.

• DETECTION: When a voice-modulated carrier arrives at a radio receiver, it is amplified and converted to a lower, easier-to-work-with frequency, and then goes through a process known as "detection" or "demodulation." In this process, the two sidebands are stripped off the carrier, then rectified. During rectification, one sideband is discarded without deleterious effect, since the same information is contained in the remaining sideband. The resulting audio frequency signal, patterned after the original voice modulation, is then fed to the loudspeaker. Although the carrier performs a useful function in the demodulation process, and may also be used for "automatic frequency control" (AFC) to keep the receiver continuously tuned to the transmitter, it does not in itself contain any of the desired voice intelligence.

• SINGLE SIDEBAND: If one of the two sidebands is filtered out before it reaches the transmitter's power amplifier, the same voice intelligence can be transmitted on the remaining single sideband. Instead of approximately one-sixth of the transmitter power going into each sideband, as with conventional AM, the combined power (one-third) can be concentrated in the single sideband, thereby increasing effective range. Equally important, the bandwidth required for SSB is approximately one-half that needed for DSB. (See Fig. D and E.)

• SUPPRESSED CARRIER: If the percentage of power which goes into the carrier is reduced further, more of the transmitter power can go into the single sideband. Carried to the extreme, this results in "suppressed carrier" SSB.





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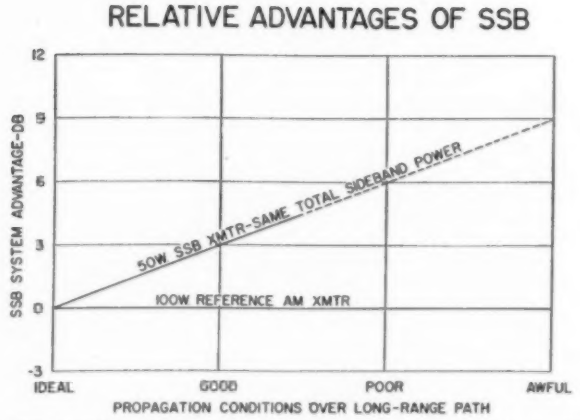


SINGLE SIDEBAND advantage gains over AM as propagation worsens.

frequency during transmission of voice modulation. This greatly eases the requirements for frequency reference accuracy.

From the standpoint of circuit simplicity and power economy, the suppressed-carrier type of SSB is generally favored. The USAF sponsored Collins equipment is of the suppressed carrier type. IATA showed a strong preference also for suppressed carrier. However, with justifiable airline conservation, IATA called for a system which could be operated either as suppressed or controlled carrier, until such time as the reliability of the airborne frequency reference is proven.

The Problems

With SSB's many advantages, it is logical to ask why the military and airlines have apparently been so slow to adopt it for air-ground communications. Single sideband has been "lurking on the horizon ever since 1915, when it was first conceived by a mathematician named Carson and—independently—by an engineer named Arnold," Honey told the IATA, adding, "Someone once remarked that single sideband has been 'invented' regularly every five years since that time."

Although SSB has been used for commercial and military ground-to-ground communications for some years, and lately has become quite popular with radio "hams," several inherent problems have discouraged its use for ground-to-air communications.

• **Extremely accurate frequency** reference needed. Suppressed carrier SSB demands a stable frequency reference accurate to within one part in a million or better. This is roughly 100 times the accuracy required for conventional DSB equipment. If the reference frequency in the receiver shifts only 50 cycles, or two parts in one million at 25 mc., it will cause a loss of voice naturalness and a slight reduction in intelligibility. If the shift is more than 200 cycles, serious loss of intelligibility occurs. (When the injected frequency is high, the pitch of the voice goes up; when low, the pitch drops, similar to the sound of a phonograph record when turntable speed is below normal.) For airborne use, the frequency reference must also be small and rugged.

• **Doppler shift effect.** A radio signal transmitted from, or received aboard, a moving vehicle undergoes a shift of frequency due to what is called the Doppler Effect. For example, at 30 mc., a signal transmitted from a fixed ground station and received by an airplane traveling at 672 mph., undergoes a 30 cycle shift. This Doppler frequency shift goes up directly with speed and frequency. It affects intelligibility of suppressed carrier SSB in the same way as a shift in the basic frequency reference. (The speed of modern aircraft would produce excessive Doppler frequency shift in the VHF band, which explains why the SSB technique is limited to use at lower frequencies.)

With a pure suppressed carrier system, there is no way to lick the Doppler shift problem without increasing circuit complexity. However, if military aircraft speeds continue to increase beyond the present supersonic range, it may be necessary to transmit a pilot tone for reference and use automatic frequency control to prevent undue Doppler shift, according to E. W. Pappenfus of Collins Radio. However, Pappenfus hopes that this can be avoided because of increased circuit complexity.

Feasible Techniques

Recently developed techniques in extremely accurate, relatively small crystal controlled oscillators (frequency reference), filters, linear amplifiers, and tubes

generally are credited with opening the door to practical air-to-ground single sideband. The frequency reference is probably the most noteworthy.

Collins, for instance, has developed a relatively small stabilized crystal oscillator which makes it possible "to secure a frequency accuracy of one part in 100 million for each of the selected crystals," according to Pappenfus. The reference holds its frequency to within one part in 10 million to 100 million over a 24-hour period.

The development of power tetrodes for transmitter final amplifiers has resulted in a great simplification of transmitter design for single sideband applications. The reason is that the power tetrode, with its simple neutralization and sizeable power gain, greatly reduces the number of stages of amplification required and minimizes circuit complexity.

The use of RF feedback improves the amplifier linearity and reduces distortion which are very important when multi-channel transmissions are applied to an SSB system, Pappenfus points out. Distortion in SSB, like overmodulation in conventional AM, partially destroys single sideband's advantage of requiring less bandwidth.

Two techniques generally used to get rid of the unwanted sideband in SSB, are: the filter method, requiring a highly selective filter with sharp cut-off characteristics; and the phasing method, which uses carefully matched phase shifting networks. In both areas, there have been significant technological strides during the past several years.

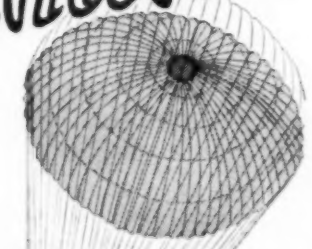
Bi-Mode Operation

To prevent compatibility problems during the period of transition from the present DSB to the new SSB, both the military and the airlines are insisting upon equipment designed for bi-mode operation. Fortunately, single sideband transmissions can be handled by conventional DSB (AM) receivers without modification, if the SSB transmitter radiates sufficient carrier power to permit the AM receiver to demodulate the incoming signal.

To permit bi-mode operation between an SSB transmitter and present DSB receivers, the transmitter will be designed to radiate a carrier plus single sideband. The receiver needs no modification.

To permit an SSB receiver to handle a signal from a DSB transmitter, it will be designed to include both an SSB detector and an AM detector, with the latter operating during conversations with a DSB transmitter. No modification will be required in existing DSB transmitters, providing they have rea-

'chutes



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sonably good frequency stability.

SSB ground equipment probably will become available and go into service before its airborne counterpart becomes available. Barring unforeseen difficulties, aircraft equipped with DSB receivers and transmitters will be able to converse with SSB ground stations, without modification of the airborne equipment. However, this is one of the things which the USAF expects to check during its evaluation tests of the Collins SSB system next year.

Despite the basic differences between DSB and SSB, there is good reason to believe that the transition to this improved type of air-ground communications can be made without serious strain, thanks to military, airline, and avionics manufacturers early recognition of the problem.

(In the second and concluding article of this series, AVIATION WEEK will describe some of the design details of single sideband equipment now under development by Collins Radio Co.)

FILTER CENTER

▶**Computed To End All Computers**—Philco is developing a tiny airborne transistorized digital computer designed to perform all computational tasks aboard an airplane, including such things as fire control, navigation and instrumentation. (Similar "central station" computers are under development by Litton Industries and possibly other firms.) In addition to this airborne computer, Philco is developing general purpose industrial and special purpose military digital computers, all employing transistors. Philco calls its family of computers Transac I, II, III, etc., which in computer lingo stands for "TRANSistorized Automatic Computer."

▶**Electronic Patent Index**—A comprehensive index of U. S. electronics patents field will soon be available to firms who subscribe to a service provided by Information for Industry, Inc. Company's address: 1108 16th St. N.W., Washington, D. C.

▶**Transistor Prices Slashed**—General Electric has made its third price reduction on transistors within the last 14 months. Latest cuts, ranging from 22 to 53%, apply to two alloy junction PNP types (2N135, 2N136) and three rate-grown junction NPN transistors (2N168, 2N168A and 2N169). New prices range from $1.50 to $1.80 each, to equipment manufacturers.

▶**MAC Triples "Brainpower"**—McDon-

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Where
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Most
FOR AC SYSTEMS SPECIFY CPPC SYNCHROS
Let Clifton Size 8's take the place of larger synchros at very significant savings in weight and bulk, yet at no sacrifice in accuracy or reliability.
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How to Blind a Radar "Eye". . . and Why

The "why" is easy
— so our aircraft can elude the piercing eye of enemy radar.
The "how" is not easy — nor can it be revealed.
But Maxson-developed, Maxson-built electronic countermeasures
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nell Aircraft Corp. has taken delivery on $500,000 worth of analog computer equipment which will triple its previous computing capacity.

▶**Jam Session**—An electronic countermeasures (ECM) trainer, intended to permit the USAF to train ECM operators under simulated tactical conditions, is being developed by Melpar, Inc., under Wright Air Development Center sponsorship. Trainer, slated for delivery this month, has mock-up of ECM position found on typical aircraft, with an instructor's console to permit monitoring of student performance.

▶**Ceramic Tubes Now Available**—Eitel-McCullough, San Bruno, Calif., is now able to supply prototype quantities of its radically different high-temperature stacked ceramic receiving tubes in two types: CD-16, a dual triode equivalent of the 6SN7, and the CD-18, a ceramic equivalent of the 6AK5W pentode. The Eimac stacked tube (AW Aug. 22, 1955, p. 61), developed under USAF sponsorship, is being tested by a number of avionics groups, including Boeing, Convair, and Hughes Aircraft Co.

▶**Attention Exhibitors**—Avionics firms which like to exhibit their hardware at avionics conventions should take note of the following:

- **Aug. 21-24:** Western Electronic Convention, Los Angeles.
- **Oct. 8-9:** Symposium on Aeronautical Communications, Utica, N. Y.
- **Oct. 29-30:** East Coast Conference on Aeronautical and Navigational Electronics, Baltimore.

▶**Authors Wanted**—The Technical Paper Committee for the second annual Symposium on Aeronautical Communications, (Oct. 8-9, Utica, N. Y.) is seeking prospective authors. If interested, submit a 200 word abstract to Mr. Fred Moskowitz, 1014 No. Madison St., Rome, N. Y. before July 1.

▶**Irradiated Plastic**—A new technique for improving the heat resistivity of polyethylene plastics by irradiating them with gamma rays from Cobalt-60, has been developed by Stanford Research Institute and the Sequoia Process Corp. Sequoia, located in Redwood City, Calif., now is in mass production on the improved plastic.

▶**Low Efficiency**—Power supplies in avionics equipments frequently have less than 50% efficiency, a Rome Air Development Center study shows. Use of new silicon rectifiers and magnetic amplifiers in regulated power supplies can boost efficiency, the study indicates.

NEW AVIONIC PRODUCTS

Computers & Accessories

• **Digital computer and differential** analyzer, can be provided as a general purpose computer only or with a digital differential analyzer accessory unit. Flexible programming permits creation of simplified interpretive sub-routines for persons with limited computer experience. Electric typewriter input-output and a high-speed photoelectric paper tape reader and paper tape punch are standard equipment. Up to four magnetic tape storage units, each with 300,000 "word" capacity, can be provided. Computer price is "far below that of existing equipment of comparable capacity," according to manufacturer. Bendix Computer Division, 5630 Arbor Vitae St., Los Angeles 45, Calif.

• **Acrolog aircraft performance** computer, a special analog computer for use by aeronautical engineers, is now available in a new Model 211. New version incorporates a "thrust-required" readout which simplifies calculation of aircraft range and endurance. Redesign and relocation of chassis components

RELIABILITY
From design to production, Whittaker gyros are built with meticulous care. This includes continuous testing of components and assemblies and 100% inspection tests of all production gyros. With hundreds of gyros shipped each month, Whittaker has an overall customer rejection of less than 2%.
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DIVISION OF TELECOMPUTING CORPORATION
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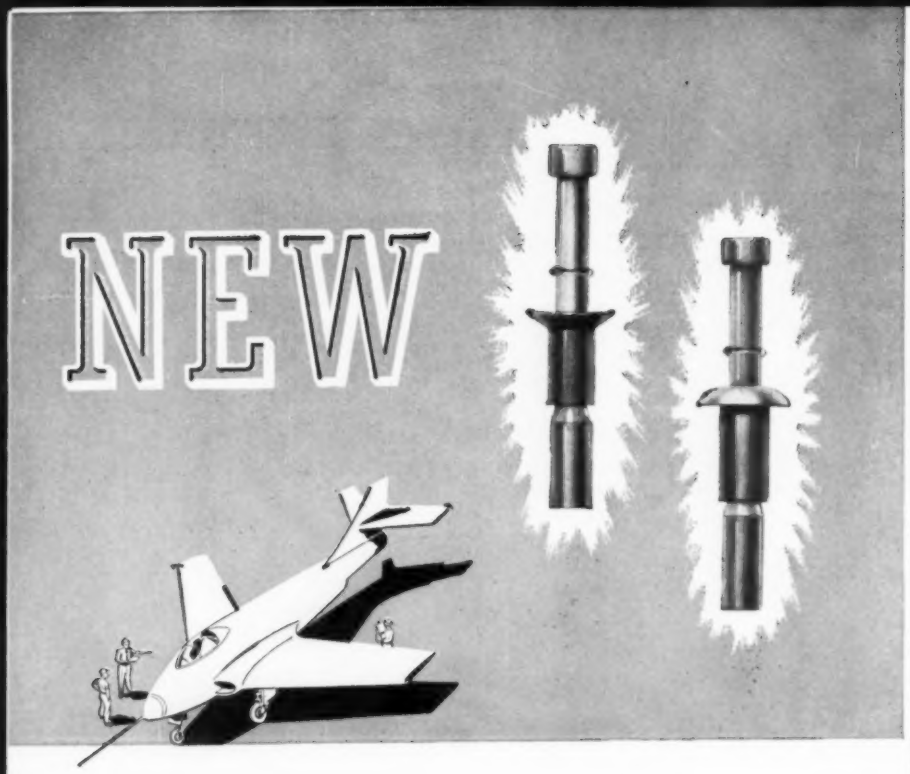


NEW CHERRY "700" Aircraft Rivet

Gives More Effective Fastening

A new, more effective fastener for the aircraft industry has been developed and is now being produced at the Cherry Rivet plant in Santa Ana, California. Designated the Cherry "700," the new rivet provides a wide grip range, positive hole fill, high clinch, uniform stem retention and permits 100% positive inspection.

The "700" rivet is versatile and in many cases one length of each diameter will cover all thicknesses of material. Also, the sheet hole size is not critical as with other rivets since the design provides positive hole fill even in oversize holes. The stem always adjusts to fill the hole which affords high stem retention independent of hole size.

The manner in which the "700" rivet is set provides high clinch by drawing the sheets together tightly and uniformly. When the "700" rivet is set, the stem shoulder protrudes above the rivet head and gives visual indication that the blind upset is properly formed, the sheet hole is filled and the rivet is properly set.

This latest fastener advancement is a typical example of how the Cherry Division has paced the industry with new and improved fasteners and the tools and accessories for applying them—all of which are designed, developed and produced in the Santa Ana plant.

This plant is devoted exclusively to the manufacture of products for the aircraft industry.

For information, write for the new Cherry "700" bulletin to Townsend Company, Cherry Rivet Division, P.O. Box 2157-N, Santa Ana, California.

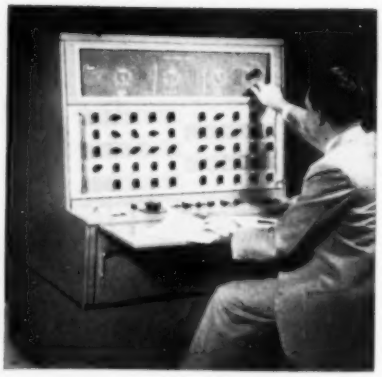
CHERRY RIVET DIVISION

SANTA ANA, CALIFORNIA

Townsend Company

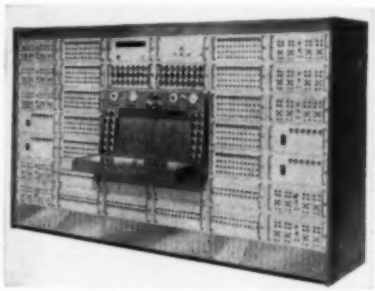
ESTABLISHED 1816 • NEW BRIGHTON, PA.

In Canada: *Parmenter & Bulloch Manufacturing Company, Ltd., Gananoque, Ontario*



has improved stability and serviceability of new model. Accuracy of computation is within 0.1% of full scale reading. A 12-page brochure, describing new Aerolog computer, is available by writing: Link Aviation, Inc., Binghamton, N. Y.

• **Analog computer,** GEDA A-14, provides up to 96 operational amplifiers and 50 or more non-linear elements in single console. Novel split problem board permits the computer to work on two separate problems simultan-



cously. Built-in problem analyzer checks the problem wiring both during and after set-up. An automatic dialing system enables operator to call out any voltage that he wishes to monitor. Goodyear Tire & Rubber Co., Inc., 1144 E. Market St., Akron 16, Ohio.

• **Time scale checking equipment,** an accessory for use with Reeves Series 400 REAC analog computors, will make it possible to quickly check the frequency limitations of any computer components. The new accessory can be used without changing the problem set-up in any way. Reeves Instrument Corp., 215 East 91st St., New York 28, N. Y.

Components & Devices

• **Subminiature precision resistor,** encapsulated, reportedly meets MIL-R-93, Characteristic A. Resistor measures 0.15 in. dia. x ⅜ in. long, comes in resistances up to 500,000 ohms with tolerances as close as 0.01%. Type NS-6AV resistor is rated 0.1 watts at 125C. Eastern Precision Resistor Corp., 677 Barbey St., Brooklyn, N. Y.

• **Miniature trim pot,** Type 769, employing metal film resistance element, can operate at temperatures of −57C to 125C, provides infinite resolution. Linearity is 5%, resistances of 50 to

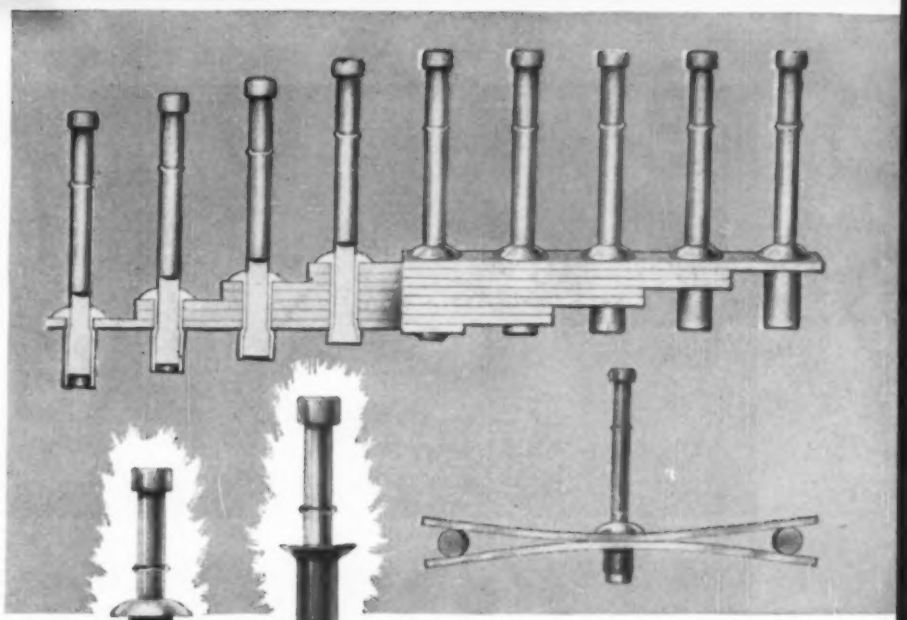
25,000 ohms are available. Unit measures ⅜ x ⅜ x 1⅛ in. Fairchild Controls Corp., Components Div., 6111 E. Washington Blvd., Los Angeles 22, Calif., or 225 Park Ave., Hicksville, N. Y.

• **Transistorized servo amplifier,** Model 1800-0100, for 400 cps. use, provides power gain of 70 db., voltage gain of 0.36 v./mv. Amplifier comes in hermetically sealed plug-in case measuring 1⅞ x 1⅛ x 2⅞ in., and weighs 4 oz. Unit is designed for operation over temperature range of −55C to 71C. M. Ten Bosch, Inc., Pleasantville, N. Y.

• **Twin power triode,** Type 5998, for use in voltage regulator applications, has amplification factor of 5.5, transconductance of 14,000 micromhos, and plate dissipation of 13 watts per plate. Tube reportedly has low microphonics, improved triode balance, and absence of grid current. Chatham Electronics, Division of Gera Corp., Livingston, N. J.

• **Miniature tandem 24-pole relay,** double-throw, with contacts rated for 2 amp. resistive load, employs counterpoise principle which enables it to exceed vibration requirements of MIL-E-5272. Procedure I, the manufacturer

says. Relay is available for operation at temperatures of −65C to 125C. Another model is available with 12 poles. Cook Electric Co., Diaphlex Div., 2700 Southport Ave., Chicago, Ill.



Excellent hole filling characteristics of Cherry "700" rivet are shown in cross section photo above. Test piece also demonstrates that various material thicknesses can be riveted successfully with rivets of identical length. Lower illustration shows high clinch attained with "700" rivet.

Versatile Cherry "700" Rivet Provides New Uniform Fastening Method

The hole filling qualities, wide grip range, high clinch, and positive stem retention now possible with the new Cherry "700" rivet give the aircraft industry a uniformity of fastening never before available.

In the past, variations in hole diameter made it virtually impossible to completely fill the hole in every instance. This difficulty is eliminated with the "700" rivet which always adjusts to fill the hole and provides high stem retention.

The method of setting the "700" rivet also provides high clinch and makes it possible to use one length to fasten a wider range of material thicknesses. Positive inspection is easy since a properly set rivet is indicated by the amount of stem shoulder protruding above the rivet head.

The "700" rivet is available in countersunk and universal head styles in a wide range of diameters and lengths. It is installed with standard Cherry rivet guns with controlled-stroke pulling heads and accessories.

A product of the Cherry Research and Development Department, the "700" rivet has back of it years of fastening experience in the aircraft industry. This organization has developed the widest range of types and sizes available in the industry. Cherry engineers have designed and built special purpose machines and developed techniques that make possible such innovations as the "700" rivet.

For technical data on how the Cherry "700" rivet will give you a more uniform method of fastening, write to Townsend Company, Cherry Rivet Division, P. O. Box 2157-N, Santa Ana, California.

CHERRY RIVET DIVISION

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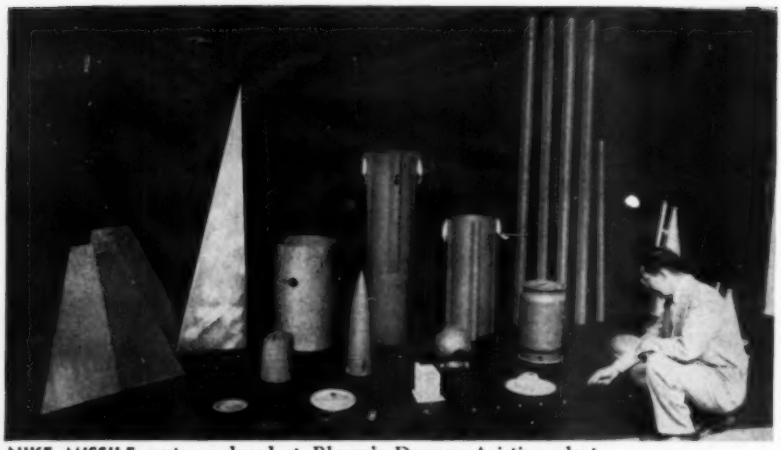
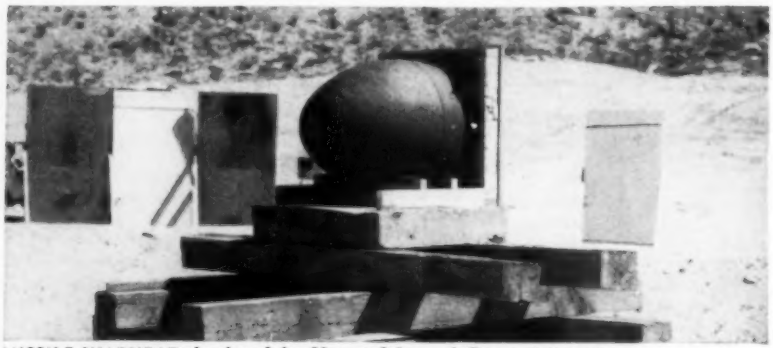


NIKE MISSILE parts produced at Rheem's Downey Aviation plant.



MISSILE WARHEAD developed for Honest John and Corporal in test. . . .

POSITION is fired at night. Warhead was developed by Rheem's Laboratory.

ANTI-AIRCRAFT missile warhead was tested against B-29 wing on ground.

Rheem's

Downey, Calif.—Weapons development is the primary function of Rheem's Research and Development Laboratory.

Among the laboratory's 22 current prime contracts are these major programs:

- **Two missile development** projects are underway for the Air Force. One of these projects is approaching the mockup stage, while the second is still in its initial phases.
- **Specialized missile warhead** development work is being conducted for application to Honest John, Corporal, and Nike B missiles for Army Ordnance, and to the Bomarc for the Air Force.
- **Development and installation** of range instrumentation equipment is projected for the Air Force Flight Test Center, Edwards AFB. Functi of the program is to provide the capability of monitoring test aircraft at greater speeds, altitudes and ranges than is possible with present systems.
- **Practice bomb development** is being carried out for the Air Force Special Weapon Center, Kirtland AFB.

In addition to these projects, the Research and Development Laboratory has submitted a design proposal to the Navy Bureau of Aeronautics for a jet-powered high-subsonic target drone. This is now being evaluated in a BuAer competition.

Laboratory Growth

Rheem's Research and Development Laboratory has been in existence only about three years, starting with a nucleus of about 30 people. Today it employs about 500 engineers, technicians, model shop specialists and supporting personnel.

It already has done about $7 million worth of work, has a backlog of about $4 million.

The laboratory is still expanding. At the present rate of growth, it is anticipated that it will have 2,000 people engaged in projected programs which will occupy plant facilities in excess of 200,000 sq. ft. within the next five years. Present facilities occupy 72,000 sq. ft.

The Research and Development Laboratory was established to provide new products for production by Rheem Mfg. Corp., the parent organization. To broaden these fields of products, the laboratory has been organized for three principal activities—missiles, explosive ordnance and electronics.

Each of these activities is set up as

In Canada: Parmenter & Bulloch Manufacturing Company, Ltd., Greenacre, Ontario

Laboratory Develops Missiles, Electronics

an independent section within the laboratory to better meet the specialized requirements of procurement agencies.

The basic philosophy underlying the operation of each section is that it must be self-supporting financially. This means that each section is responsible for the creation of new ideas worthy of development and the promotion of these ideas into contracts. These contracts must be taken through the research, development and prototype manufacturing stages, showing a profit.

Profits Invested

This has been accomplished thus far through the operation of the Research and Development Laboratory, and the profits earned have been reinvested for additional expansion in the form of new equipment and floor space.

From the time of its organization, the Research and Development Laboratory has recognized the importance of limitations in certain technical fields.

For example, in guidance and control the laboratory is staffed to manage this aspect of work, but it is not staffed to develop these items. Actual development of guidance and control equipment accordingly has been subcontracted to specialists in the field.

Rheem itself is an important subcontractor. The company's Downey Aviation Plant is expanding its production facilities to take care of new subcontracts in both the airframe and jet engine fields.

The airframe subcontracting represents a good cross-section of aircraft and includes the F-104, F-102, F-100, T2V, T33, F-89 and B-52 parts. Also included in Rheem's subcontract work are Nike guided missile parts.

Rheem is now tooling up to produce the complete empennage for the Lockheed F-104. This includes the movable horizontal stabilizer, rudder, yaw damper and fin.

Tooling will be completed this summer and parts for the F-104 will come off the line this fall.

Currently, Rheem is doing structural redesign of the fin for the Convair F-102 and is tooling up for its production. Tooling for production of the F-102 windshield framing and canopy also is underway. Fins will be delivered this summer, while windshields and canopies will follow shortly thereafter.

For the North American Aviation F-100D, Rheem is in production on the ailerons, flaps, wing tips, fin, rudder, wing leading edge slats and movable horizontal stabilizer.

B-52 ejection seats for the bombardier and navigator are being fabricated for Boeing.

For Douglas, Rheem is producing Nike fins, center and aft body sections, fuel hoppers and propellent pressure vessels.

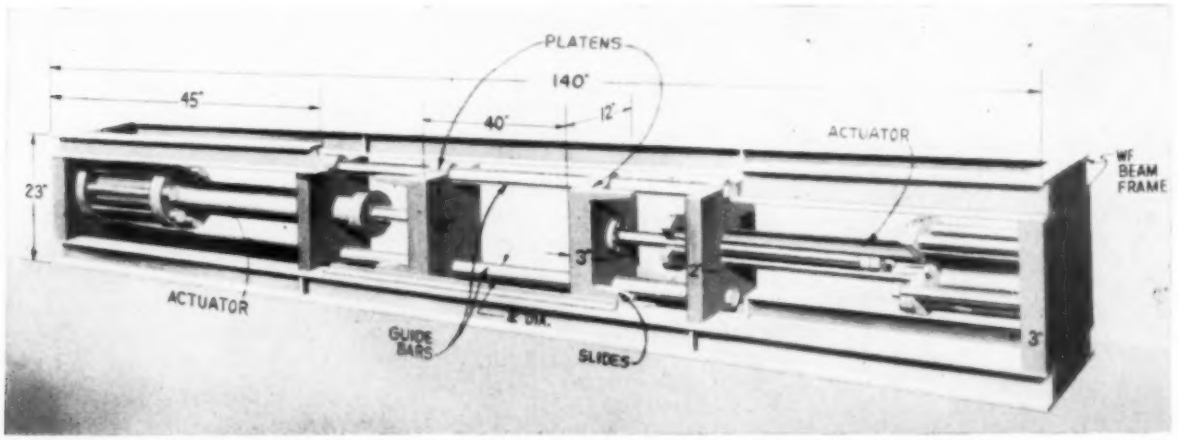
Rocket Tubes

The company is producing the nose section for the Lockheed T2V. For the T33, Rheem is in production on the nose, inlet ducts, air scoops, and seats.

For the Northrop F-89D and H, Rheem is fabricating the rocket tubes and the nose section.

In the jet engine field, Rheem is tooling up to produce the afterburner and the intermediate case assembly for the Pratt & Whitney J57 being built by Ford. On the Ford-built J57, Rheem is now producing the inlet guide vane, diffuser case and bearing housing.

For the Allison J71, the company is producing turbine nozzles.



HIGH-VELOCITY IMPACT machine will approximate this general arrangement in prototype being built by Convair.

Convair Forms Metals by Impact

San Diego—A new high-velocity impact principle for forming metals has been devised at Convair Division of General Dynamics Corp.

This forming principle is now being embodied in a double impact machine which offers absolute definition of parts, eliminating subsequent hand forming.

According to T. E. Pipe, Convair's director of manufacturing research and development, the high-velocity impact forming scheme is expected to eliminate the need for hot-forming of titanium alloy parts.

It also is believed that this rapid forming method may be a satisfactory one for forming stainless steel without the need for working the material at subzero temperatures.

Convair's conclusions of what the high-velocity impact process will achieve are based upon various experiments with a special press utilizing an explosive-type charge as a means of energizing the head.

Because of the difficulty involved in handling and controlling explosives,

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DUAL FLOAT SWITCHES

F-8480 weighs only 1.75 lbs. . . . operates 1.05" to 4.90" range . . . from —65 to 160 deg. F. Includes two hermetically sealed relays, SPDT, 3 amp motor load at 28 volts DC, 100,000 cycles minimum. Conforms to MIL Specifications. Heater unit (extra) for extreme temperature-humidity conditions.

Revere dual float switches have multiple applications. Used for automatic cut-off control in refueling operations, remote indication of fuel or fluid level in tanks, automatic C.G. control to actuate pumps or valves.

Revere Dual Float Switches allow use of two separate systems either as emergency or two-level control. Floats are only moving parts . . . non-absorbent for long-time accuracy. Permanent magnets in float actuate hermetically sealed Glaswitch* at precise levels. Vibration-proof, slosh-proof. Many types available.

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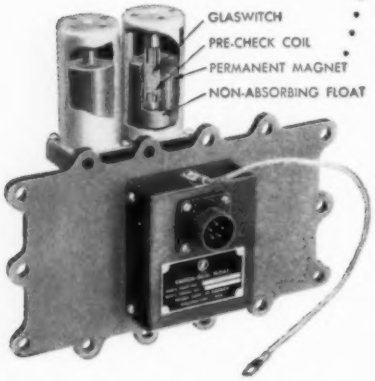


F-70140 weighs 1.50 lbs. . . . for —65 to 160 deg. F. use. Contains one DPDT hermetically sealed relay. Rating—2½ amp at 28 volts DC, 100,000 cycles minimum. Precheck coils permit testing of switch when tank is dry. Conforms to MIL Specifications.

Ask for Engineering Bulletins 1050 and 1051 describing Revere Float Switches.

Revere CORPORATION OF AMERICA 19

WALLINGFORD, CONNECTICUT A Subsidiary of Neptune Meter Company

Convair sought a safer, simpler energy source. It was discovered that high-velocity, high-force impacts could be obtained with a pneumatically-energized actuator which had been developed at Convair for shock-testing of structural components.

The actuator operates on a thrust-amplifying principle. Basically, it embodies two pressure chambers in line and separated by a plate.

One of the chambers is fitted with a piston faced with a seal which closes off an orifice in the separating plate when the force behind the piston exceeds that acting upon the face of the piston through the orifice.

When the force acting on the piston through the orifice overbalances its counter force, the actuator is automatically triggered. This unseals the orifice and allows the pressure to react on the entire face of the piston, producing a large, unbalanced thrust which imparts high acceleration to the thrust column (piston rod) of the actuator.

Convair is constructing a prototype high-velocity impact forming machine by using two actuators opposed, producing a force on ½-in. forming depth of approximately 1.2 million lbs. Closing speed of the two platens will be 200 feet-per-second.

The machine will serve as a laboratory device to evaluate the advantages of extremely high, fast-acting forces in impact forming and to compare the rapid squeeze of the process with the slow squeeze of the hydropress.

Results obtained with the prototype machine will be used as a basis for design of future production machines.

The prototype is scheduled for completion this summer.

American Contracts For Idlewild Terminal

American Airlines has signed a 27-year lease with the Port of New York Authority for construction of an individual passenger terminal building at New York International Airport.

American is the third carrier to contract with the Port Authority for passenger facilities in Idlewild's "terminal city" development. Eastern Air Lines and United Air Lines signed last September.

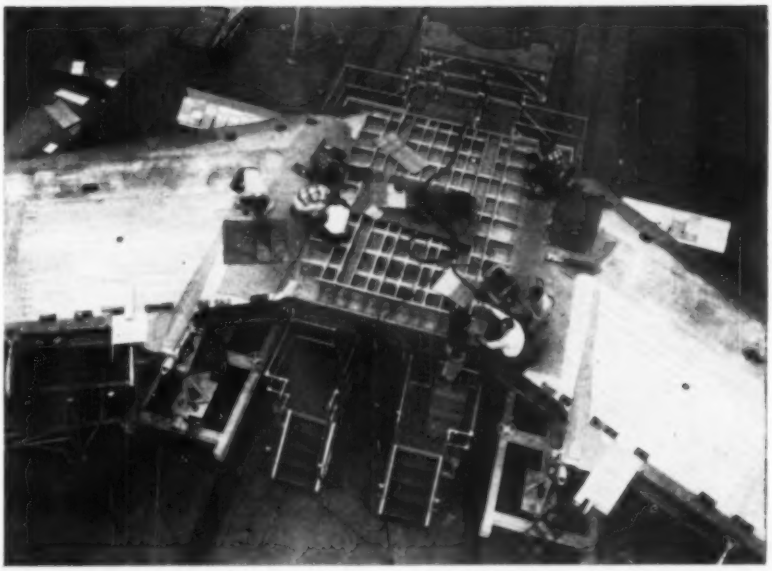
According to a joint American Airlines-Port Authority announcement, American will pay an annual rental of $67,000 for the facility. The terminal will be located on an 18-acre site, will be able to handle 12 aircraft simultaneously and contain ticketing, restaurant and similar passenger accommodations.

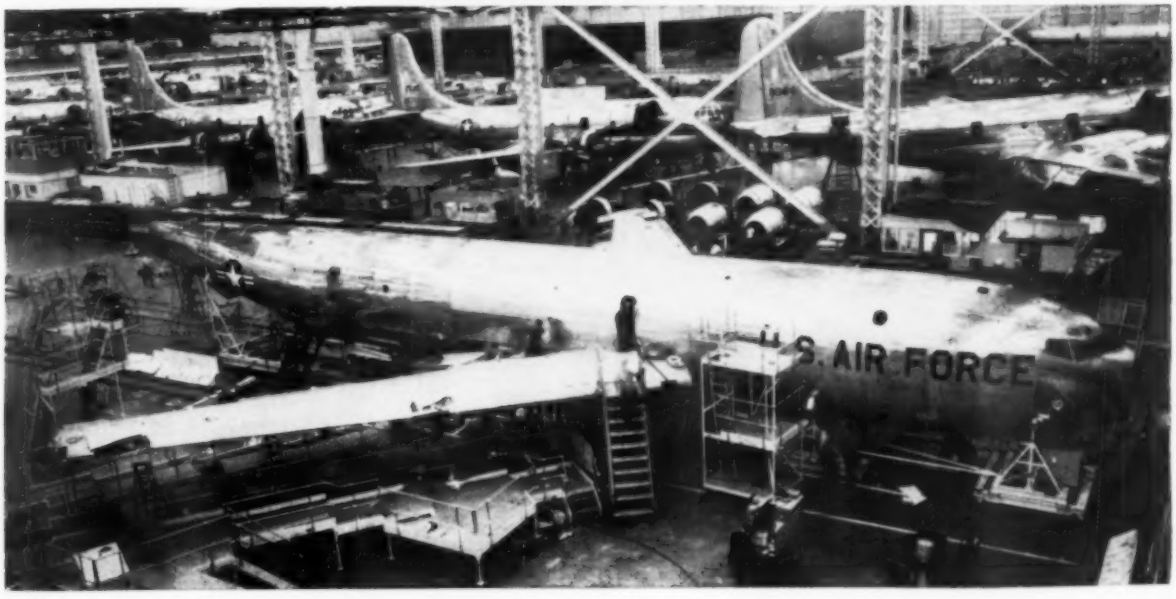
First KC-135 Jet Nears Completion

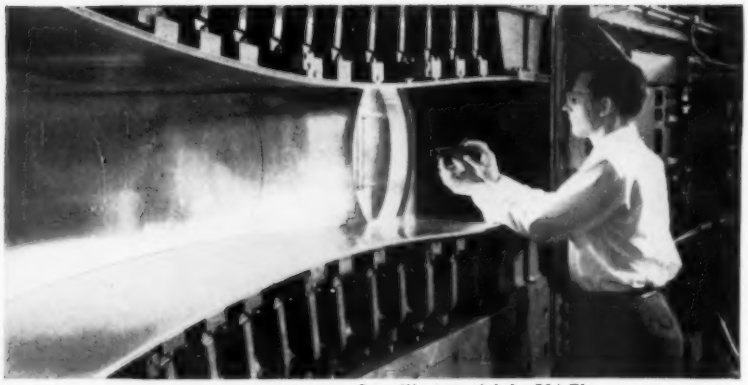
First U. S. jet transport production line has become an actuality at Boeing Airplane Co.'s Renton, Wash., plant where the initial KC-135 tanker-transport is nearing completion. It makes a sharp contrast with piston-powered KC-97 Stratofreighter production lines (background, bottom photo).

Swept-wing assemblies are attached to a KC-135 center section (photo, right); plane depicted at top and bottom have wing sections attached to fuselage. Note the large four-wheel main landing gear assembly near the four-jet transport in top photo (foreground). Nosewheel assembly has been attached.

Initial Boeing KC-135 Stratotankers will be powered by four Pratt & Whitney J57 split-compressor turbojets.







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Research Department

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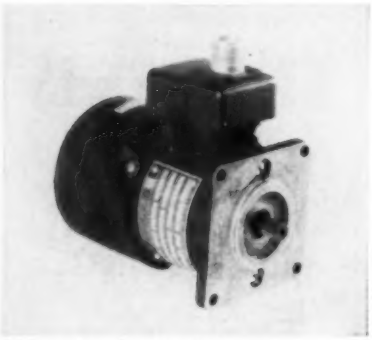
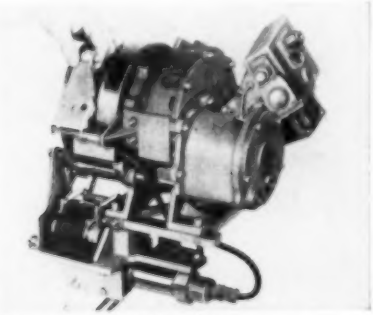
NEW AVIATION PRODUCTS



Motor for Coolant Pumps

New line of continuous-duty explosion-proof Type AK aircraft motors for coolant pumps are available in ratings from 1/100th to 1/7th hp. within a speed range of 2,800-14,000 rpm. Special brushes are available that provide a minimum brush life of 500 hr. at any altitude to 60,000 ft.

Westinghouse Aircraft Equipment Dept., Wapakoneta Rd., Lima, Ohio.



Rescue Hoist Package

A self-contained hydraulically operated personnel rescue hoist system for helicopter installations is also applicable to all airborne hoist requirements and requires only one hour to install.

Unit is basically a 600-lb. capacity hoist expanded to include all necessary controls and protective devices. Permanent installations required in the aircraft are two hydraulic lines plus electric switches and their wiring. Installation is made by bolting the hoist and its support to the mounting area and connecting the hydraulic and electrical fittings. A pump is installed in the aircraft's engine and connected to the hoist plumbing.

Features include: level-wind mechanism, anti-snarl device, electrically actuated cartridge-operated cable cutter, cable pay-out and reel-in limit controls, automatic anti-over-run control and automatic mechanical brake.

Vickers, Inc., 1462 Oakman Blvd., Detroit 32, Mich.

Pocket Flight Computer

E-1 pocket-size navigation computer makes available a long scale of wind speeds, airspeeds and ground speeds. It is equipped with a sine scale to solve wind vector and other problems with a minimum of steps. For example: on a high-velocity wind vector problem, the E-1 will provide the answer with one setting, three readings and two scales.

Unit can also be used as a protractor and to compute pressure patterns.

Warner Instrument & Sales Corp., 4734 N. Austin Ave., Chicago, Ill.

Frequency Change Generator

A line of synchronous motor-driven frequency changing generators to convert 60-cycle current to 400-cycle power source, accurate enough for aircraft and missile testing are available in portable or stationary mountings.

Sets come in 5, 10, 15, 30, 45, 60

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"Your impressive customer list—and the many good reports from pilots using your engines—are two reasons we picked Airwork as our overhaul agency. But the most important reason was the confident, capable look of the men we saw working in your shops; the same men that would work on our engines, too."

E. Reed Zimmerman
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New Holland Machine Co.

8 out of 15 "Million Miler" Safety Awards went to pilots flying Airwork Overhauled engines.

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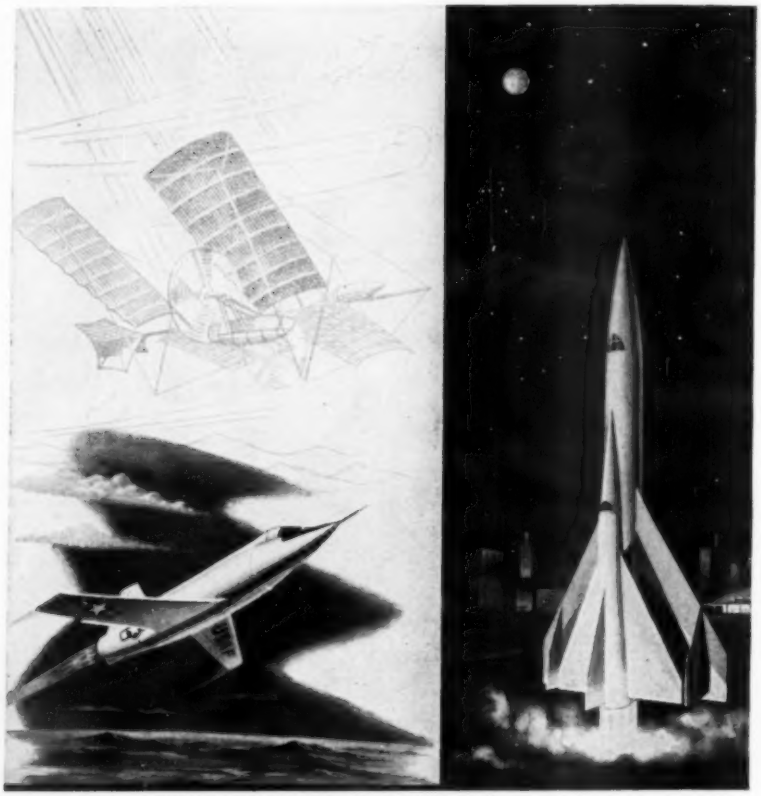

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The builders and pilots of the early bamboo, cloth and wire aircraft were men of great courage and vision — they had to be.

Today's methods of construction are drastically different. Now, every part going into a plane is carefully tested by all possible methods. Different too, are the men who design and build these planes. Each man is not only an engineer, but a specialist in a particular field. The attributes these men have in common with the early builders are vision, resourcefulness and a pioneering spirit.

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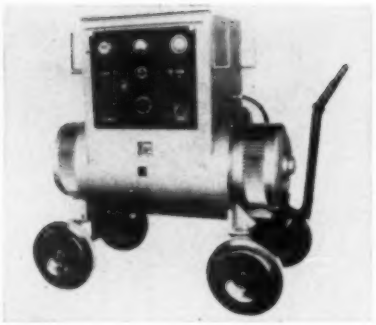


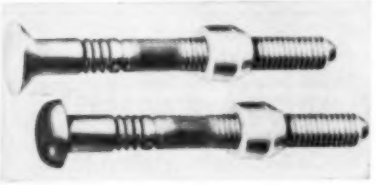
and 75-kw. capacities; output voltage and frequency is not affected by voltage fluctuations of the incoming power supply. Regulation of output voltage is ±1%, controlled by a static-type (magnetic amplifier) voltage regulator.

Motor Generator Corp., Hobart Brothers Affiliate, Troy, Ohio.

ALSO ON THE MARKET

Snap-back recessed handles for use on instruments, spare parts boxes, etc.; meet clearance, environmental and physical test requirements of MIL-T-945A and MIL-T-4734. Available in three models: SK-M-124A and SK-H-124A of steel construction for load capacities from 200 to 350 lb., and aluminum SK-M-T-300 for 75 lb. capacity.—Skydyne, Inc., Port Jervis, N. Y.

Lockbolts for aircraft come in complete range of diameters, grip lengths and head styles; available in alloy steel and



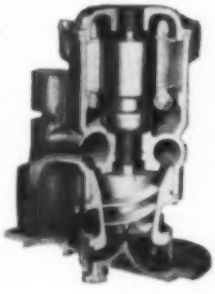
aluminum alloy. Tension and shear values are in accordance with ANC-5 Bulletin.—Cherry Rivet Division of Townsend Co., Santa Ana, Calif.

MB-5900 engine mount is said to be lightest and strongest isolation mount designed specifically for R2800-C engines. Mount includes an aluminum housing and separate steel stud; stud is easily removed and replaced if damaged. Due to interchangeability of the two mount parts, a new stud is not necessary if housing is damaged. Six mounts per engine weigh 20.7 lb.—MB Manufacturing Co., New Haven, Conn.

Permacel 196 Plastic Film-Solvent Activated is suitable for die cutting and conforms to military specifications for

design predictability

Trying to firm up new fuel pump specs? Well, stop staring at your slide-rule...call Hydro-Aire right now. The performance of our HY-V/L* Fuel Booster Pump is as predictable as ants at a picnic. We'll show you a simple chart method that'll pull the clouds out of that crystal ball.



Yes, the HY-V/L can be *tailored* to your specific needs. And that has already been done by such customers as Chance Vought, McDonnell, North American and Douglas.

HY$^{V}/_{L}$* fuel booster pumps

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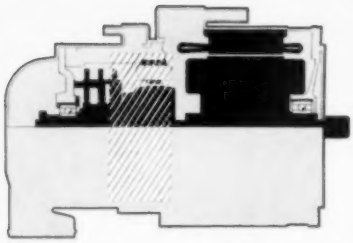
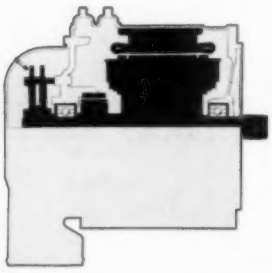
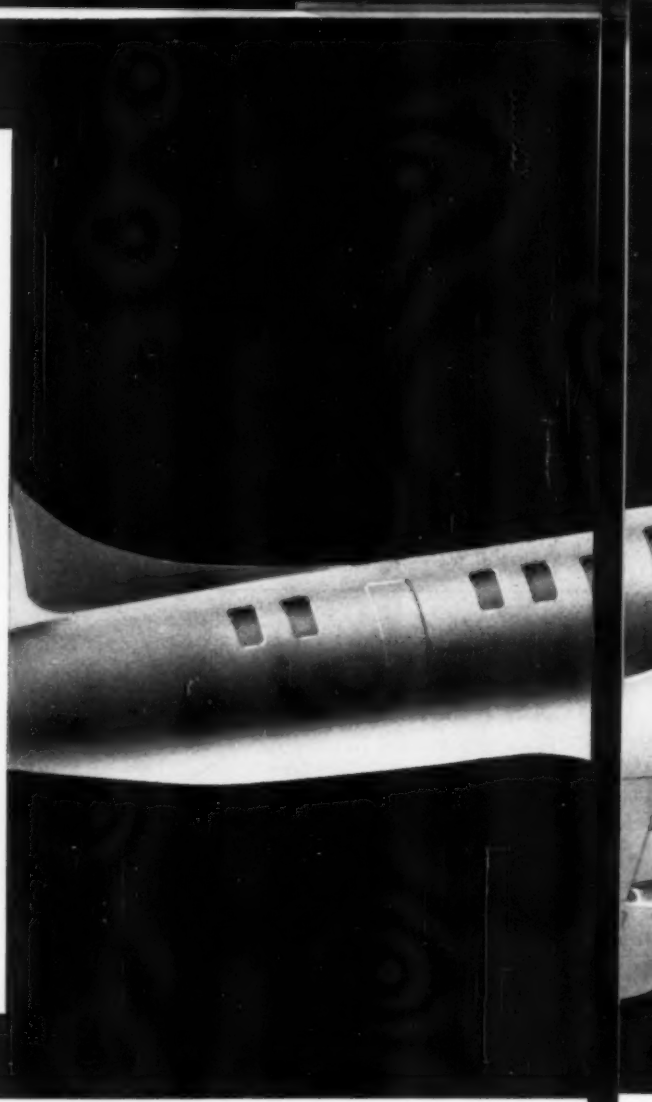


CONVENTIONAL 60 KVA GENERATOR



NEW STATICALLY EXCITED 60 KVA GENERATOR

Static exciter components mounted within the fuselage of the Lockheed Electra replace the rotating exciter of conventional generators. This design simplification reduces generator overhung moment by approximately 180 pound-inches, eases handling, and improves generator cooling and ability to withstand vibration.



Why Lockheed Electra Will Use New General

DESIGN SIMPLIFICATION GIVES RELIABILITY DEMANDED BY TURBINE-POWERED AIRCRAFT

The new Statically Excited Generator combines the proven design principles of the conventional General Electric generator with the increased performance potential of static excitation.

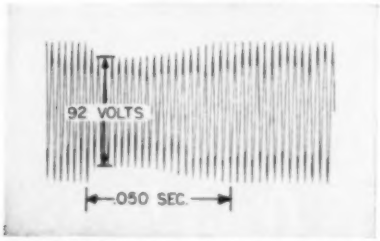
Unscheduled delays due to rotating exciter failure or lack of residual magnetism are eliminated. Maintenance cost is reduced because static exciter parts do not need attention between major aircraft overhauls and commutator undercutting and neutral brush setting at time of overhaul are eliminated. Reduced size of the new generator simplifies removal and installation. Also radio interference problems are greatly reduced by elimination of the commutator.

Fire hazard due to energy available for feeder fault after trip is minimized because the static excitation system retains less than one volt a-c while rotating exciter systems have residual of from 50 to 100 volts. Design improvements in the new generator allow higher operating temperatures, permitting one generator to carry the load of two under emergency conditions.

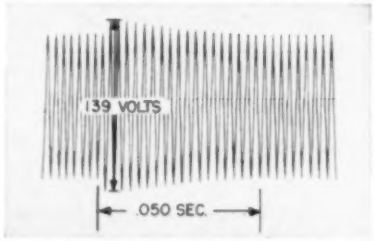
For further information on the new Statically Excited Generator contact your nearest G-E Apparatus Sales representative or write for bulletin GEA-6015, Section 210-100, General Electric Co., Schenectady 5, N. Y.

Electric Statically Excited A-C Generators

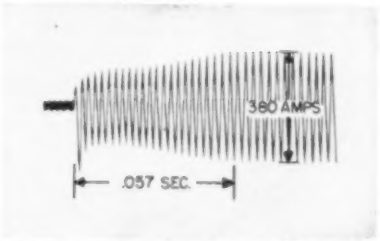
Fast Response Improves Performance of Electronic Equipment



APPLICATION OF FULL LOAD—Normal voltage is reached in .050 second after application of full load. Voltage dip reaches 92 volts—80% of normal voltage.*



REMOVAL OF FULL LOAD—Normal voltage is reached in .050 second after removal of full load. Maximum overshoot is 139 volts—121% of normal voltage.*



SHORT CIRCUIT BUILD-UP—Achieves full short circuit output in .057 second after three phase fault. Steady state current is 380 amps—342% of rated current.*

*Performance obtained with a typical 40 KVA model.

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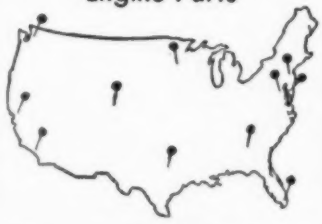

Wherever you fly in the United States—North or South, East or West—you are within easy reach of a factory-authorized distributor of Pratt & Whitney Aircraft engine parts.

These approved distributors keep adequate stocks of up-to-date P&WA factory parts. They have facilities, highly skilled personnel, and all current P&WA instructions to meet your maintenance and overhaul needs.

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  - *Branches at:*
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SOUTHWEST AIRMOTIVE COMPANY
- Love Field, Dallas, Texas

NORTHWESTERN AERONAUTICAL COMPANY
- Holman Field, St. Paul, Minn.

AIRWORK CORPORATION
- Municipal Airport, Millville, N. J.
  - *Branches at:*
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    - 2705 So. Oakland St., Arlington, Va.
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Division of United Aircraft Corporation
East Hartford, Connecticut

exterior decalmanias on aircraft. It is oil and flame resistant (self-extinguishing), pin-hole free, and dimensionally stable. Available in 50-yd. rolls and widths up to 36 in. Physical characteristics: 11-lb./in. width tensile strength, 80-oz./in. width adhesion to aluminum and steel, 44% elongation.—Permacel Tape Corp., New Brunswick, N. J.

Temprex, extruded Teflon-coated wire for high-temperature service, is impervious to all known commercial solvents. Ambient temperatures from minus 90C to plus 250C will not change electrical or physical characteristics. Sizes range from 26 to 10 AWG inclusive; available in production length. MIL-W-16878A and MIL Standard 104 requirements are met for type E and EE construction.—Hitemp Wires, Inc., Windsor Ave., Mineola, N. Y.

Lightweight repeat cycle timers, primarily for balloon instrumentation, are 3 in. deep, 2¼ in. high, 1¾ in. wide and weigh 6.1 oz. Brush assembly design gives a normal service life of more than 2,500 hr. of continuous operation.—Brailsford & Co., Inc., 670 Milton Rd., Rye, N. Y.

Insulating caps for aircraft wire ends that can be threaded on by finger are made of nylon and are chemically inert to fluids encountered in aircraft systems. Threaded cap bites into the wire insulation to form a tight protective seal that holds despite severe vibration; caps are color coded to facilitate installation. Available in sizes for #20-#16 wires.—Thomas & Betts Co., 36 Butler St., Elizabeth, N. J.

Simulation table now contains a standard low-frequency function generator; this single degree of freedom roll table will respond dynamically to sinusoidal, triangular, or square wave imputs from the function generator or complex wave forms from an external source. Unit with associated amplifier is a high-performance servo system with a natural frequency in excess of 15 cps. and a threshold of less than 5 microradians (1 second of arc).—Micro Gee Products, Inc., Box 1005, 6100 West Slauson Ave., Culver City, Calif.

Series 1400 Continental connector, for aircraft applications, is available in 51 contacts. It features pin contacts hermetically sealed in a stainless steel receptacle shell; socket contacts in the plug are spring-temper phosphor bronze and gold plated. Six polarizing key positions are available.—Electronic Sales Division, DeJur-Amsco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y.

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Burbank, California

USAF Contracts

Following is a list of unclassified contracts for $25,000 and over as released by Air Force Contracting Offices:

HEADQUARTERS AMC, Wright-Patterson Air Force Base, Ohio.

Glenn L. Martin Co., Baltimore 3, Md., mobile training unit, (PR H-222320), $145,000.

General Electric Co., Erie, Pa., a.c. generators and voltage regulators, 3 ea., conduct tests and furnish test report, engineering data, monthly progress reports, material reports, (PR 1844), $7,550.

Jack and Heintz, Inc., Cleveland 1, Ohio, generator, tachometer, (P/N6122-H60-103), 1,000 ea., (PR MA-598555), $41,560.

Lear, Inc., 110 Ionia Ave., N.W., Grand Rapids, Mich., indicator, attitude, remote, type B-1A, 209 ea., indicator, attitude, remote, type MM-2, 5,230 ea., control, roll and pitch, vertical gyro operation, type K-4B, 2,899 ea., (PR 673538, 673571 and 673572), $4,645,148.

Fairchild Camera and Instrument Corp., Robbins Lane, Syosset, L. I., N. Y., spare parts, (PR 636277 and 664106), $25,963.

General Electric Co., X-Ray Dept., 4855 Electric Ave., Milwaukee, Wis., replacement spare parts and retrofit kits for the D-37 camera, (PR MO-664066 and MO-664062), $26,924.

Cosmos Industries, 31-28 Queens Blvd., L. I., N. Y., indicator, ID-314/APA-90, 571 ea., selector, C-917/APA-90, 923 ea., relay, PE-11/APA-90, 917 ea., maintenance spare parts, bulk, (PR PL-159217), $179,748.

Ford Motor Co., 3000 Schafer Rd., Dearborn, Mich., J57-F-13 jet engines (A1J2313), J57-F-19W jet engines (A1J2319), J57-F-21 jet engines (A1J2321), (PR 204552, 204553, 236417, 236418, 236419, 236131), $265,776,509.

Jack & Heintz, Inc., Cleveland, Ohio, starters, a.c., Aerno 42-8803, 171 ea., (PR PE 673978), $39,378.

Bendix Products Div., Bendix Aviation Corp., South Bend 20, Ind., brake assemblies, Aerno 41-1676, 2,181 ea., wheel assemblies, Aerno 41-1675, 1,311 ea., (PR PE-235879), $1,331,163.

Kearfott Co., Inc., 1150 McBride Ave., Little Falls, N. J., components of type J-4 compass system, 600 ea., (RFP PE-235880), $1,191,733.

Avco Mfg. Corp., Lycoming Div., 550 Main St., Stratford, Conn., aircraft engines, R1820, aircraft engines, R1300-3, 102 ea., (PR PE-202112 and PE-202113), $2,758,672; R1300 and R1820 engine special tools, R1300-4 engine AIR 0504, 4 ea., R1820-76A engine, 9 ea., R1820-84 engine, 147 ea., R1820-84 engine special tools, (MIPR R56-987-Aer; R56-988-80-Aer; R55-5061-223-Aer and R56-111-23263S/12-13-15/ASO), $4,170,450; R1820-84 engines, data and special tools, 23 ea., R1820-82 engines and data, 7 ea., (MIPR R-53-3365-195-Aer and R-56-982-5-Aer), $793,985.

Bendix Aviation Corp., Eclipse-Pioneer Div., Teterboro, N. J., maximum-minimum airspeed systems, (PR 204166), $78,981.

Sperry Gyroscope Co., Div. of Sperry-Rand Corp., Great Neck, N. Y., components of engine analyzer system, (PR 489110, 489111, 598554 and 598558), $216,104.

General Tire and Rubber Co., 1708 Englewood Ave., Akron, Ohio, wheel and brake assemblies, 41-1192 wheel AFA-1403-3, 234 ea., 41-1193 brake, AFA-1409-a, 234 ea., (PR 635764 and Amend No. 1), $176,551.

Lear, Inc., 110 Ionia Ave., Northwest, Grand Rapids, Mich., indicator, attitude, remote, type MM-1, 712 ea., (PR PE673530, PE635829), $459,952.

U. S. Gauge Div., American Machine & Metals, Inc., Sellersville, Pa., transmitter, pressure, torque type MG-1 MIL-T-25092, Aerno 61-9139, 410 ea., (PR 635856), $48,929.

The Lewis Engineering Co., 339 Church St., Naugatuck, Conn., type MJ-2 temperature indicator, Aerno 61-8857, 3437 ea., (PR 635817), $114,732.

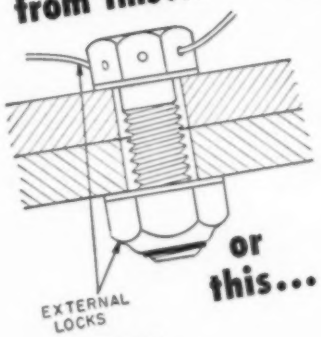
Red Bank Div., Bendix Aviation Corp., Eatontown, N. J., motor generator, 115 V line, 444 ea., (PR 611253), $107,923.

The Lewis Engineering Co., 339 Church

How to Do Away With Lock Nuts and Lock Wiring

use HELI-COIL* Screw-Lock Inserts

from this...



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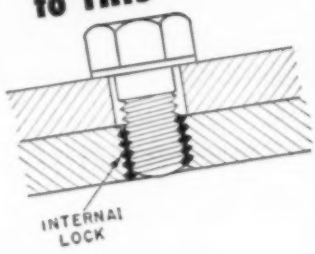


Screw-Lock Inserts meet AN-N-5b and MIL-N-25027 military specifications for lock nuts.

For years designs requiring lock nuts or lock wiring have plagued designers with problems of space, weight and costs. Each lock nut, even a small one, takes space, has weight and costs money. Every bolt locked with wire requires a through hole in the head, positioning and wiring. The simplicity of many a superior design has been lost due to these cumbersome methods of fastening.

Now for the first time good designers can do away with these "design plaguers." They can accomplish the same end results plus a saving of weight, space and money by a new revolutionary concept in fasteners—*Heli-Coil* Mid-Grip Screw-Lock Inserts. This new fastener is a stainless steel wire insert with locking threads. It can be installed easily and puts the locking effect *inside* the tapped hole—protects the tapped threads for life—and locks the mating screw or the bolt with the same torque as a lock nut. This Screw-Lock Insert not only provides a stainless steel protecting thread, locks the screw or bolt, but most important of all—eliminates the space and weight of a lock nut—the wiring necessary in lock wiring.

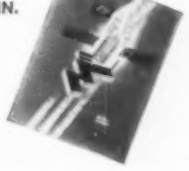
Heli-Coil Mid-Grip Screw-Lock Inserts can readily be distinguished from regular non-locking *Heli-Coil* Inserts by their distinctive red color.

*Reg. U.S. Pat. Off.

HELI-COIL SCREW-LOCK INSERTS

Products of Heli-Coil Corporation, Danbury, Conn.

HELI-COIL CORPORATION
524B SHELTER ROCK LANE, DANBURY, CONN.



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We **CERTIFY** the metal that lets it fly faster

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Guaranteed machineability. One of the early bugaboos of titanium was the element carbon, which if present even in small quantities made the metal hard to machine. Mallory-Sharon introduced consumable-electrode double melting, which enables us to guarantee a maximum carbon content of one-tenth of one per cent. At this level titanium machines as readily as stainless steel.

Certified Properties. By introducing statistical quality control methods to production, we've not only improved quality, but can certify physical properties of each heat within definite limits. This has simplified production tooling and reduced costs for fabricators.

With improvements like these, titanium's use is rapidly expanding . . . saving hundreds of pounds in aircraft weight . . . or serving as a corrosion-resistant material in other products. For quality you can depend on, call us for your requirements in strong, lightweight, corrosion-resistant titanium.

MALLORY-SHARON TITANIUM CORPORATION, NILES, OHIO.

MALLORY Ti® SHARON

St., Naugatuck, Conn., Thermocouple lead, P/N 6126-L141-100, 5000 ea., thermocouple lead, P/N 6126-L141-700, 653 ea., (PR 598551), $29,011.

Electrical Engineering and Mfg. Corp., Los Angeles, Calif., actuator assemblies, P/N 4290-C824C1, 406 ea., maintenance data, (PR SA-545896), $78,284.

Summers Gyroscope Co., 2328 Broadway, Santa Monica, Calif., indicating systems, directional gyroscope, remote, 3 ea., conduct tests and furnish test report, engineering data, monthly progress reports, (PR 9289), $39,972.

The General Tire and Rubber Co., 1708 Englewood Ave., Akron, Ohio, wheel assemblies, nose, for F-102A aircraft, (PR 635756), $56,122.

The Leland Electric Co., Div. of American Machine & Foundry Co., Dayton, Ohio, motor generator, 95 ea., (PR 662503), $74,543.

Leland Electric Co., Div. of American Machine & Foundry, Dayton, Ohio, motor generator, 981 ea., (PR 672758 & 235850), $665,544.

General Electric Co., 600 Main Street, Johnson City, N. Y., MD-4 FCS (for B-47) spares and MT and TE, (PR 218500, 218444), $881,082.

Red Bank Div., Bendix Aviation Corp., Eatontown, N. J., motor generators, 312 ea., (PR 239619), $166,661.

Sundstrand Machine Tool Co., Rockford, Ill., drives, alternator, constant speed hydraulic, 40 KVA, (AERNO 48-530, 48-534, 48-528, 48-527, 48-529), (PR PE159376-1), $5,506,847.

The Goodyear Tire & Rubber Co., Inc., 1144 E. Market St., Akron 16, Ohio, wheel assemblies, 20.0-20, Main, 644 ea., brake assemblies for 20.00-20 main wheel, 336 ea., (PR 636128), $498,576.

Bendix Aviation Corp., Bendix Products Div., South Bend 20, Ind., brake assemblies for F-86H aircraft, (PR 00-497166), $338,783.

General Electric Co., 11 W. Monument Bldg., Dayton, Ohio, generators, 51 ea., control panels, 51 ea., (PR 672769), $103,978.

Bendix Aviation Corp., Bendix Products Div., South Bend 20, Ind., wheel assemblies, for C-133A aircraft, brake assemblies for C-133A aircraft, (PR 635757), $542,677.

Sundstrand Machine Tool Co., Rockford, Ill., drives, constant speed, (PR PE 159377), $1,068,357.

Farrand Optical Co., Inc., Bronx Blvd & E. 238th St., N. Y., N. Y., Y-7 sight, bomb, vertical, periscope, 21 ea., MA-1 desiccator, 23 ea., ML-1 indicator sighting angle, 23 ea., spare parts, data and MT&TE., (PR PE218-460 and PE218469-1), $488,943.

Nems-Clarke Co., Silver Springs, Md., relay solenoid RE-132/ARC, 953 ea., engineering data, 1 set, (PR OC666482), $101,-495.

Varo Mfg., Co., Garland, Texas, power supplies, 605 ea., (PR 635591), $100,677.

Boeing Airplane Co., Wichita, Kans., evalution of B-47 main landing gear components, (PR PA-210556), $80,275.

Cessna Aircraft Co., Wichita, Kans., procedure long lead time materials, supplies and contractor-furnished equipment required for the manufacture of T-37 trainer aircraft, (PR PH 144026), $373,000.

Lear, Inc., 110 Ionia Ave., Northwest, Grand Rapids, Iowa, MB-2 autopilot systems F-84F retrofit, MB-2 autopilot systems RF-84F retrofit, MB-2 autopilot systems (spares systems), spare parts, special tools and data, (PR MO66428 and MO 664831), $3,038,728.

Ford Instrument Co., Div. of Sperry Rand Corp., 31-10 Thomson Ave., Long Island City, N. Y., computer, latitude and longitude, CP-188A/ASN-6, 224 ea., amplifier, AM-916/ASN-6, 227 ea., indicator, ID-389/ASN-6, 375 ea., control computer, C-1316/ASM-6, 250 ea., (PR PE-158708), $2,592,805.

Radio Corp. of America, Engineering Products Div., Camden 2, N. J., AN/ARC-34 radio sets, spare parts, test equipment and data, 898 ea., (PR 158702, 158744 and 158702-1), $1,450,000.

General Motors Corp., AC Spark Plug Div., Flint 2, Mich., gun-bomb-rocket sight, type A-4, 238 ea., spare parts, MT&TE and data, (PR 218430 and 218430-1), $1,450,000.

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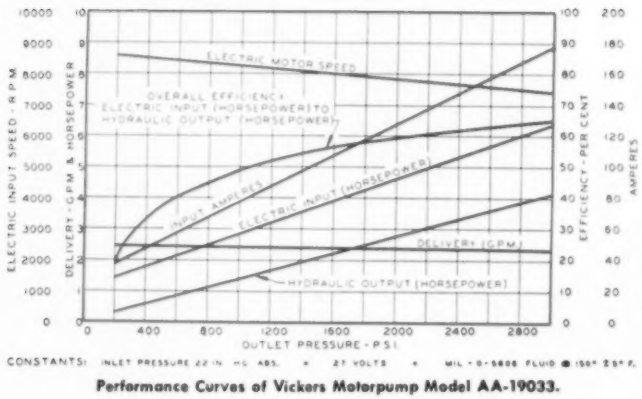
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★ **LESS WEIGHT**
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★ **EXPLOSION PROOF**
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Navy Contracts

Following is a list of unclassified contracts of $25,000 and over as released by Navy Contracting Offices:

BUREAU of AERONAUTICS, Washington 25, D. C.

Aerojet-General Corp., Azusa, Calif., rocket motors, (new), 150, rocket motors (with Gov't furnished chambers), 348, NOas 56-197-f (MA-36-5449-55), $386,580.

ACF Industries, Inc. (Erco Div.), P. O. Box 209, Hyattsville, Md., Aero 14B series combination bomb rack and rocket launcher modification kits, NOas 56-343-f (MA-36-4159-56), 80,000, $234,740.

Connecticut Telephone and Electric Corp., Meriden, Conn., R-425/ARW-59 radio receivers, mounts, antennas and spare parts, NOas 56-404-f (PD-33-733-56), 242, $200,-417.

Cambridge Corp., 119 Windsor St., Cambridge, Mass., design, develop, manufacture and furnish a prototype portable liquid oxygen tank, trailer mounted, 15-gallon capacity, fabricate and furnish prototype tanks of the approved design, NOas 56-482-f (AE-51-1881-56), 6, $37,852.

New Haven Clock and Watch Co., 140 Hamilton St., New Haven 4, Conn., Aero 4B-1 bomb shackles release, NOas 56-342-f (PD-43-1367-56), 1,128 ea., $78,543.

Cook Research Labs Div., Cook Electric Co., 2700 Southport Ave., Chicago 14, Ill., conduct research, design, fabricate, calibrate, test and furnish six experimental models of a flashing light source of high intensity for use with transmissometer detector equipment and spectrometer to be installed in an aircraft and flown at considerable distance from the source of light, NOas 56-336-c (AY-3-5414-56), $55,151.

Mallory Sharon Titanium Corp., Niles, Ohio, conduct a study to develop a means for processing thin titanium alloy sheet suitable for use in metal sandwich construction, and produce and furnish two 36" x 72" sheets in the optimum thickness under .020", rolled under this investigation, NOas 56-265-f (AE-41-654-55), $29,946.

Glenn L. Martin Co., Baltimore, Md., services of four factory-trained field service technicians to serve as instructors to provide instructions to Naval and Marine Corps personnel in the field in the operation, maintenance and servicing of P5M aircraft, NOas 56-205-s (MA-33-4437-56), $70,797.

Utica Div., Bendix Aviation Corp., Utica, N. Y., services of two factory-trained field service technicians to instruct Naval and Marine Corps personnel in the field in the operation, repair, maintenance and servicing of starters, NOas 56-176-s, (MA-33-4438-56), $32,648.

Ruffe, Inc., 7525 N.W. 37th Ave., Miami, Fla., kits of parts to modify 14B-2 combination bomb rack and rocket launcher to type 14B-2, NOas 56-310-f (PD-43-3144-55), 790, $29,348.

Sperry Rand Corp., Sperry Gyroscope Co. Div., Great Neck, L. I., N. Y., engineering study and design, fabricate and furnish prototype, all-weather, single panel instrumentation system for HOK-1 helicopter, NOas 56-01-d (AE-73-1835-56 & Chg. A), 1, $101,179.

Sperry Rand Corp. (Sperry Gyroscope Co. Div.), Great Neck, L. I., N. Y., design, develop, fabricate and furnish two (2) air borne gyro compass systems, NOas 56-169-f (AE-73-1849-56), $100,218.

Holley Carburetor Co., 11955 E. Nine Mile Road, Van Dyke, Mich., services of 4 factory trained field service technicians to provide instruction to Naval and Marine Corps personnel in the maintenance, servicing, overhaul and modification of fuel control equipment, NAas 56-175-s (MA-33-4439-56), $55,077.

NAVAL AIR MATERIAL CENTER, Philadelphia 12, Pa.

E. W. Bliss Co., 1375 Raff Rd., SW, Canton 10, Ohio, forging presses, vertical, straight side, solid frame, mechanical, 1,000 ton capacity, Bliss Model F-81, single crank full eccentric, their Bul. 42, Spec 55-27, type 1 size 1, complete with additional

Few buyers are as particular about aluminum castings as tire makers. Their tire molds must be extremely accurate, dense, and concentric. Intricate tread designs must be reproduced faithfully.

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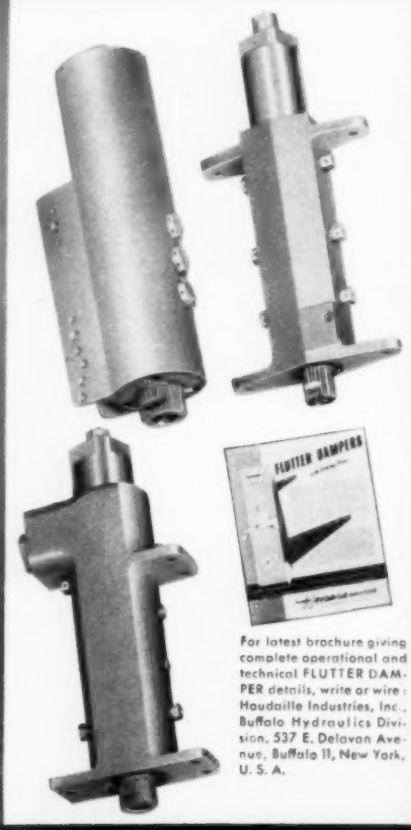

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equipment, 6 ea., $467,190; forging presses, same as above, except 1,300 ton capacity, single crank full eccentric, 6 ea., $568,680; forging presses, same as above, except 1,600 ton capacity, single crank full eccentric, 9 ea., N156-32745(156/250260/56), $1,131,-200.

Colonial Broach & Machine Co., P.O. Box 37, Harper Station, Detroit 13, Mich., broaching machines, vertical surface, double ram type, electromechanical (planer type) drive, 15 ton minimum broaching force, 66" minimum stroke length, Colonial Broach Model MVT-15-66, Spec 55-22, type 1, size 1, complete with motors, controls, coolant system, work tables and hydraulic power unit for fixture operation, but less fixtures, 3 ea., $142,200; broaching machines, same as above except 100" minimum stroke length, Model MVT-15-100, type 1, size 2, 9 ea., $472,455; broaching machines, same as above except horizontal surface, two-way broaching type, 20-ton minimum broaching force 180" minimum stroke length, Model HM-20-180, type II size 1, 3 ea., N156-32683(156/250024/56), $233,175.

Merriman Bros., Inc., 185 Amory St., Boston 30, Mass., stanchion assembly, in accordance with NAF drawings 22-60266, 22-60265-1 and military specifications, NAF part No. 22-60266-1, 5 ea., $35,780; pattern equipment for use in manufacture of guard, NAF Pt. No. 22-30995-1R, 1 set, $62; pattern equipment used in manufacture of guard NAF Pt. No. 22-31426-1, 1 set, N156-32799(156/250256/56), $56.

SPECIAL DEVICES CENTER, Port Washington, N. Y.

John Mohr & Sons, Chicago, Ill., redesign and modify low pressure altitude chamber, Nonr-1948, $98,179.

Erco Div., ACF Industries, Inc., Hyattsville, Md., twin engine flight simulator trainers, Nonr-1955, $791,965.

North American Aviation, Inc., Columbus, Ohio design, development and construction of aircraft cockpit procedures trainers, Nonr-1947, $114,466.

Beech Aircraft Corp., Wichita, Kans., design, development and construction of T34B aircraft landing gear, flap and brake systems, trainers, Nonr-1934, $53,764.

Stanley Aviation Corp., Denver, Colo., design, development and construction of ejection seat trainer, Nonr-1957, $148,300.

Link Aviation, Inc., Binghamton, N. Y., design, development and construction of flight simulator trainer instruments, Nonr-1958, $63,869.

M. Ten Bosch, Inc., Pleasantville, N. Y., design, develop and construct ship projector unit for tactical trainer, Nonr-1951, $29,793.

AVIATION SUPPLY OFFICE, Philadelphia 11, Pa.

John Addison Footwear, Inc., 84 Chestnut St., Marlboro, Mass., shoes, flight deck, (383/44G3/24/56), 4,125 pr., $25,575.

McCulloch Motors Corp., 6101 West Century Blvd., Los Angeles 45, Calif., launchers, (383/2110-813/53, 383/2110-167/54, 383/-2150-1621X7/3/51), 51 ea., $28,468.

North American Aviation, Inc., Columbus Div., Columbus, Ohio, parts for AJ aircraft, (383/29011-48A3/2/56), various, $37,198.

Herman Nelson Div., American Air Filter Co., Inc., 1834 Third Ave., Moline, Ill., preheaters, (383/29065-20S3/21/22/56), 187 ea., $147,618.

Sperry Gyroscope Co., Div. of the Sperry-Rand Corp., Great Neck, L. I., N. Y., indicators, (PREN11-1264/56), 317, $208,205.

Lear, Inc., 110 Ionia Ave., N. W., Grand Rapids, Mich., drive, motor assys., (383/2120-564X6/3/52), 108 ea., $28,911.

General Electric Co., 1405 Locust St., Philadelphia, Pa., technical publications, (PREN11-5480-56(388/55), various, $44,205.

South Bend Lathe Works, 425 E. Madison St., South Bend 20, Ind., lathes, (IFB-383-227-56), various, $26,953.

Hub Paint & Varnish Co., Inc., 47-38 5th St., Long Island City 1, N. Y., enamel, (IFB-383-441-56), 14,704 gal., $35,445.

Weber Aircraft Corp., 2820 Ontario St., Burbank, Calif., fittings, escutcheons, seat assys., (IFB-383-58-56), various, $30,929.

Stratoflex, Inc., P. O. Box 10398, Ft. Worth, Texas, fitting ends, hyd., pneu., (IFB-383-471-56), 181,999 ea., $35,143.

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Ave., New York 1, N. Y., helmets, summer, flying, (JD-IFB-383-398-56), 3,366 ea., $44,737.

Lewis Engrg. Co., 339 Church St., Naugatuck, Conn., temperature indicators, (IFB-383-306-56), 785 ea., $54,950.

Standard Machine Products Co., 5438 Ella St., Philadelphia 20, Pa., aircraft tow bars, (IFB-383-83-56), 300 ea., $36,973.

Harvick Mfg. Corp., 10727 S. Garfield Ave., So. Gate, Calif., aircraft tow bars, (IFB-383/83-56), 450 ea., $55,218.

Lockley Machine Co., 310 Grove St., New Castle, Pa., aircraft tow bars (IFB-383-83-56), 614 ea., $74,985.

Boston Insulated Wire & Cable Co., 65 Bay St., Boston 25, Mass., wire, (IFB-383-260-56), various, $27,265.

Kollsman Instrument Corp., 80-08 45th Ave., Elmhurst 73, N. Y., airspeed indicator, (IFB-383-40-56), 177 ea., $25,143.

Thor Power Tool Co., 175 N. State St., Aurora, Ill., impact pneumatic wrench, (IFB-383-408-56), various, $83,704.

American Machine & Metals, Inc., United States Gauge Div., Clymer Ave., Sellersville, Pa., fuel pressure transmitters, (IFB-383-455-56), 772 ea., $51,850.

ODM Grants Aviation Tax Certificates

United Aircraft Corp. has been granted certificates of necessity for rapid tax amortization by the Office of Defense Mobilization. Hamilton Standard Division was awarded a $4 million certificate for military aircraft and parts with 60% allowed for accelerated amortization. Pratt & Whitney Aircraft Division was awarded a $1,281,000 certificate for military aircraft engines with 65% allowed.

Other certificates for the period March 22 through April 4 are:

Curtiss-Wright Corp., Propeller Division, Caldwell, N. J., aircraft parts, $124,550 certified with 65% allowed.

Lockheed Aircraft Corp., Burbank, Calif., military aircraft, $600,223 certified with 60% allowed; military aircraft, $753,500 certified with 60% allowed; Missile Systems Division, Van Nuys, Calif., military aircraft, $359,496 certified with 65% allowed; Maywood, Calif., military aircraft, $1,735,000 certified with 60% allowed.

Sanitary Scale Co., Belvidere, Ill., aircraft parts, $13,640 certified with 70% allowed.

Bendix Aviation Corp., Friez Instrument Div., Towson, Md., scientific instruments, $55,420 certified with 65% allowed.

Kearfott Co., Inc., Van Nuys, Calif., military aircraft instruments, $27,651 certified with 65% allowed.

Kawneer Co., Aircraft Products Div., Niles, Mich., aircraft parts, $238,599 certified with 65% allowed.

Sperry Piedmont Co., Sperry Rand Corp., Charlottesville, Va., electronic equipment, $900,000 certified with 40% allowed.

Motorola Inc., Phoenix, Arizona, research and development, $49,393 certified with 65% allowed.

Hughes Tool Co., Culver City, Calif., aircraft parts, $92,165 certified with 65% allowed.

The Marquette Metal Products Co., Cleveland, Ohio, military aircraft parts, $242,495 certified with 65% allowed.

Ryan Aeronautical Co., San Diego, Calif., aircraft engine components, $169,374 certified with 65% allowed.

Rohr Aircraft Corp., Chula Vista, Calif., military aircraft assemblies, $750,000 certified with 60% allowed.

Standard Oil Co. of Indiana, Sugar Creek, Mo., aviation alkylate facilities, $19,000 certified with 15% allowed; $2,475,000 certified with 50% allowed, $3,500,000 certified with 100% allowed.

Ex-Cell-O Corp., Highland Park, Mich., aircraft engine parts, $166,880 certified with 65% allowed.

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50,000 Ft. Inverters to MIL-I-7032C

Leland P/N	*Military Designation	Spec. Weight	Leland Weight	Savings
SE-15-2	MS25161/AF Type MB-3	45	41.0	4 lbs. or $2,000
SE-16-3	MS25093/BuAer E5109-2	20	14.0	6 lbs. or $3,000
SE-20-2	MS25096/BuAer E54806-1	45	42.0	3 lbs. or $1,500
MGE-22-1	MS25095/BuAer E52805-1	35	33.0	2 lbs. or $1,000
MGE-23-1	MS25097/BuAer E54807-1	62	44.5	17.5 lbs. or $8,750
MGE-31-1	MS25162/AF Type MB-2	65	44.5	20.5 lbs. or $10,250

*Design conforms to MS. Not necessarily approved.

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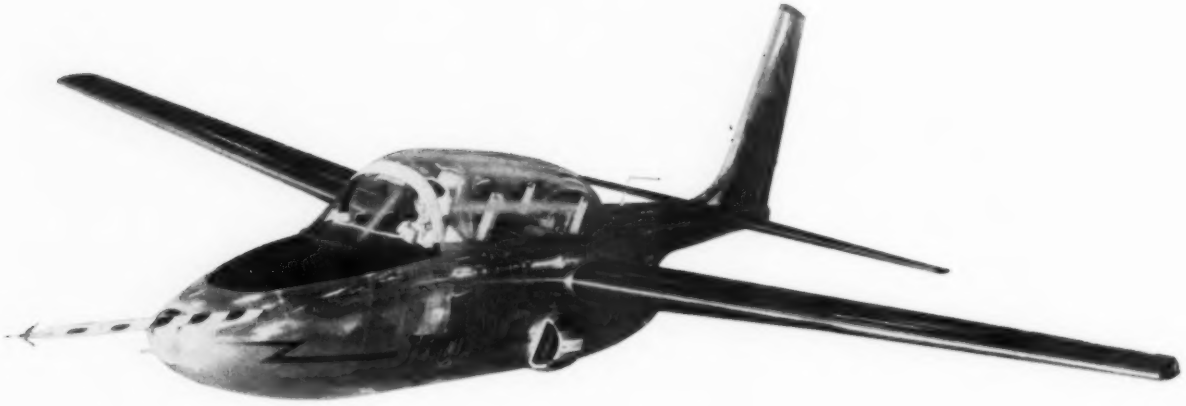
Temco's new Model 51

A primary trainer



with true jet performance

The Temco Model 51 is a *completely new* primary jet trainer with true jet performance. Developed and financed entirely by Temco, it is as advanced as the jet age for which it was designed.

A two-place, tandem, mid-wing plane of simple, light-weight low-cost design, it is rugged and reliable throughout. It has a maximum level flight speed at least 50 mph faster than the quoted performance of any other fully equipped single-jet primary trainer.

Simple and safe enough for a student pilot's first solo, it still incorporates a host of operational jet aircraft systems including among others ejection seats, liquid oxygen and hydraulic speed brakes. In design and performance, the Model 51 has been engineered without compromise to meet the jet age requirements of military training commands.

FACTS ABOUT THE TEMCO MODEL 51 JET TRAINER

Engine	Continental YJ-69-T-9 turbo-jet
Gross Weight	4,137 pounds
Total Capacity	165 gallons
Ultimate Load	11.25 Gs
Maximum Dive Speed	450 knots
Maximum Speed (15,000 ft.)	300 knots
Cruise Speed (25,000 ft.)	215 knots
Stall Speed	60 knots
Service Ceiling	35,000 ft.
Rate of Climb	1,900 ft./min.

TEMCO

AIRCRAFT CORPORATION, DALLAS

AiResearch Building $600,000 Facility for Business Flyers

By Bernie Lang

Los Angeles—To keep up with increasing demands by business aircraft owners for modifications and service, Garrett Corp.'s AiResearch Aviation Service Division will move into a new $600,000 facility at Los Angeles International Airport late this year.

Under construction are four hangars, each large enough to shelter a Constellation, a pilot's lounge, customer service quarters and administration building.

AiResearch Aviation Service is a business J. C. Garrett, president, started in self defense about 10 years ago when he bought one of the first retired DC-3 airliners.

Unable to find anyone at that time to modify the airline interior into a comfortable and efficient executive-type airplane, Garrett turned to his own company's six-man maintenance crew for the conversion.

Today, Aviation Service is a 300-man operation and a separate division of the Garrett Corp. It has put executive interiors into about 150 airliner-type aircraft. Last month, the division was selected by American Airlines to design and build the lounge units for the airline's DC-7 "Royal Coachmen" series. Another recent contract calls for building lounge interiors, specially styled by Douglas Aircraft Co., for DC-7Cs on order for Pan American, Braniff, Swissair, Canadian Pacific and Panagra airlines.

The largest corporation fleet it has worked on is General Motors, believed to be around 30 aircraft. They've modified planes for Jacqueline Cochran, General Electric, Douglas Aircraft Co., Sears, Roebuck & Co., many oil companies and a fleet of S-55 Sikorsky helicopters for Los Angeles Airways when it expanded from an all-mail to a passenger-mail service.

Recently they converted the first production-line Convair 440 Metropolitan for executive duties for Cities Service Oil Co., New York, and installed custom-built interiors in six U.S. Air Force Convair 440s.

Executive interior requirements of business corporations vary widely, the company reports, and accordingly, price varies. A DC-3 can cost from $25,000 up to $300,000. The reason: in the case of the DC-3, Aviation Service sometimes sells not only the interior but the plane as well in a package. Otherwise, DC-3 interiors run up to $60,000. Convair interiors run from $35,000 to $160,000, Lodestars from $20,000 to $60,000. Twin Beechcrafts can be custom-modified for $2,500 to $7,000.

Typical Conversion

What does a company get for such an investment?

A typical DC-3 job starts with ripping out the old interior and then stripping the plane to the bare airframe to make certain it is structurally sound. Major steps that follow in the modification program include:

• **Larger engine.** Aviation Service suggests that the Pratt & Whitney R1830-92 engine be replaced by the more powerful R1830-94. The newer

Weejet Navy Trainer

New Carma Weejet side-by-side primary jet trainer taxies out for takeoff during its flight test program before undergoing Navy evaluation. Powered by a single 920-lb.-thrust Continental J69-T-9, the Weejet's top speed is more than 300-mph. at sea level (AW April 16, p. 34). It has exceeded 350 mph. in test dives. Gross weight is 3,440 lb. with 132 gal. of fuel. Provision has been made for fitting auxiliary wingtip fuel tanks holding 50 gal. each.

NORTH AMERICAN HAS BUILT MORE AIRPLANES

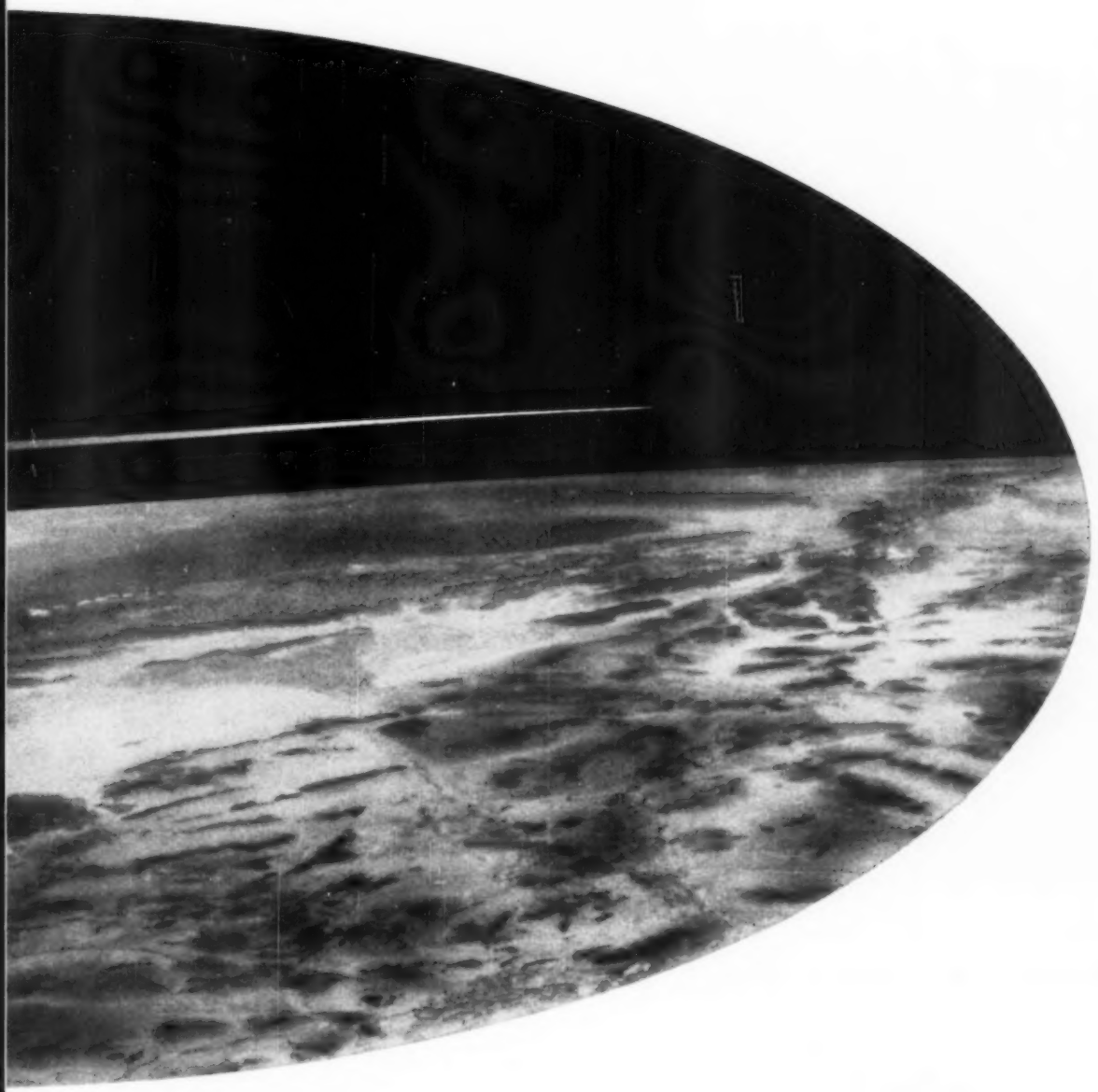
JET POWER

TODAY

The Navy's new FJ-4 FURY Jet Fighter is now undergoing its carrier trials. Newest in the FURY family of carrier-based jets, the FJ-4 climbs faster . . . maneuvers at higher altitudes, with longer range. This new and faster FURY is a product of North American's Columbus Division —a completely integrated aircraft engineering and production center where even faster, more potent aircraft are in continuing development. North American Aviation is a prime supplier of advanced aircraft to the Department of Defense.

NORTH

THAN ANY OTHER COMPANY IN THE WORLD



ART BASED ON OFFICIAL U. S. NAVY PHOTOGRAPH

SPACE POWER

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The SM-64 NAVAHO Intercontinental Guided Missile is a logical partner of our continuing development of supersonic, piloted aircraft. Security restrictions prohibit any details — but we can say that the NAVAHO will fly great distances at speeds far beyond supersonic. It will be guided and flown by automatic controls, driven by high-thrust rocket power. The NAVAHO extends the striking power and long-range defense of our nation farther than ever before.

North American Aviation, Inc., Los Angeles, Downey, Canoga Park, Fresno, Calif.; Columbus, O.

NORTH AMERICAN AVIATION, INC.

Engineers: write for details regarding challenging positions now open.

Salute to America's global "keepers of the peace"!

At this very moment, miles above the earth, dedicated crews of the Strategic Air Command are boring through silent space on precision, combat-ready training missions. Some are high over a polar icecap, or far out over the oceans. Other SAC crews, and their jet bombers, are poised on American and overseas bases, ready for instant action.

At any moment, day or night, SAC's training operations can be changed into combat operations, unleashing mighty retaliatory nuclear strikes against the war-making power of any aggressor, anywhere.

As the potential wielder of this massive force, Strategic Air Command has, since its founding ten years ago, functioned as the free world's "keeper of the peace."

To maintain this great force on the keenest edge of readiness, SAC crews—ground and flight—operate around the clock on a combat alert basis. Flights and missions follow split-second timetables. Entire wings, accompanied by aerial freighters and tankers, are rotated in regular training operations to bases in England and North Africa.

Last year, Strategic Air Command's keepers of the peace flew over 100,000 individual missions, totaling more than 1,000,000 hours of flying time.

On this 10th anniversary of the founding of SAC, the men and women of Boeing join a grateful nation in saluting the men of the Strategic Air Command. Boeing is proud that, over the decade, it has been privileged to work as a partner, designing and building SAC's tankers and bombardment aircraft. The Strategic Air Command's Boeings range from its first B-29s and B-50s to today's rugged KC-97 tankers, swift six-jet B-47 medium bombers, the eight-jet B-52 intercontinental bombers and the KC-135 jet tanker-transport now under construction.

BOEING

engines increase take-off horsepower from 1,200 to 1,350, step up cruising speed 20 mph., and increase gross weight capacity by 1,700 lb.

• **New cowl flaps.** Aviation Service will rework cowl flaps. Flaps on the top half of the engine nacelle are "fixed," while those around lower half are controllable. This cuts down air passing over engine, so that it runs hotter, gives better performance. New flaps also reduce maintenance and increase speed.

• **Geared rudder trim tab.** Aviation Service's tab incorporates mechanical boost linked to the trim tab and reduces forces by one-half. When the full 1,350 hp. is used for takeoff, the company says it is mandatory to have the tab installed.

• **Geared aileron trim tab.** The new aileron trim tab functions similar to the rudder trim tab. The larger engines, teamed with geared aileron and rudder trim tabs, give higher cruising speed which permits increase of allowable gross weight to 26,900 lb. The aileron trim tab can be used with the smaller engines for added safety.

• **Extra fuel tanks** with gross weight increase, extra fuel tanks can be installed in outer wing panels. With 300 gallons of extra fuel in each wing, range of the DC-3 is extended about 800 miles at average cruising speed, under average weather conditions.

• **Personalized custom interiors.** Interiors are designed to make every inch useful. Custom-tailored furniture, cabinets, kitchen buffets, divans and reclining swivel chairs all are styled and tailored in Aviation Service shops. Cabin air conditioning and heating systems also are installed by the company.

For Lockheed Lodestar operators the company designs and fabricates nylon fuel cell installations to replace the integral tanks, and does a complete stress analysis of the wing structure and a vibration test of the outer wing panels.

For Convair 340 operators it designs and fabricates portable-collapsible towbars and an acoustical installation that substantially reduces sound levels in the cabin.

Considering that business flying hours last year represented a 45% gain over 1951's 2,950,000 hours, it is understandable that Aviation Service's activity gained momentum. During its growth, Aviation Service got over the peaks and valleys of its type of business by concentrating on "specialty items," such as rudder modifications and DC-3 wings that can be traded in for wings with special tanks.

It enlarged its business volume by a new radio and electronics department. "By the dozens, planes come in for completely new radio and communications equipment, in addition to radar installations," says Jack O'Brien, man-

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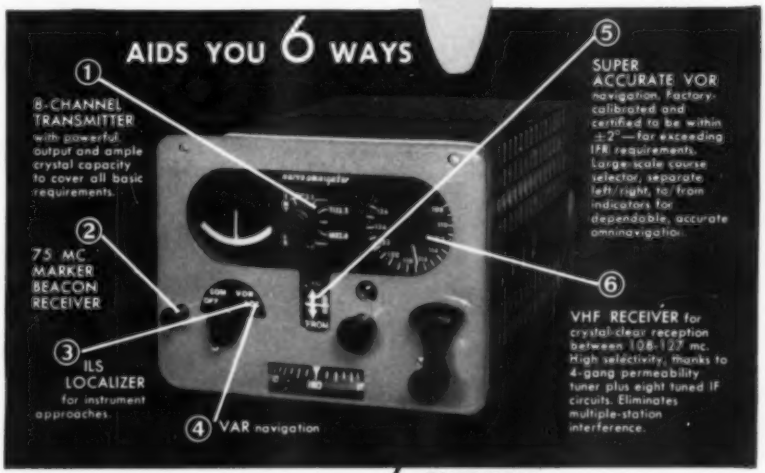
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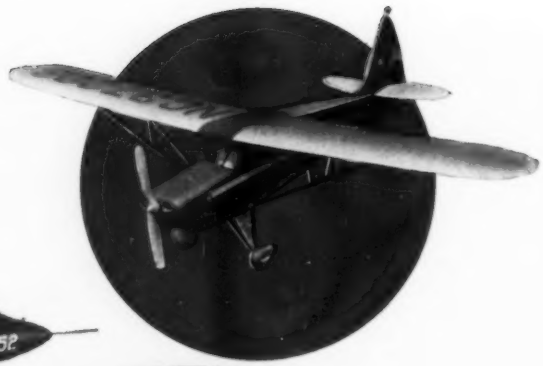
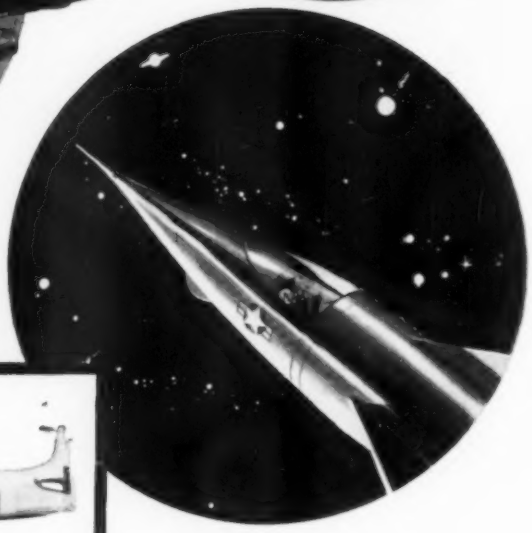
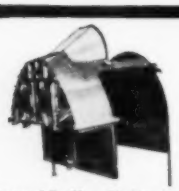


today...

and...





Forward Section, AD Fuselage; Windshield Assembly attached

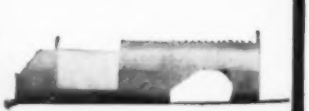
AD Fuselage Assembly

AD Vertical Stabilizer

AD Windshield Assembly

Hiller Helicopter Fuselage

AD Pilot's Seat Support



Left Hand Side A3D Bomber

Aft Section AD Fuselage

Yesterday – in the important airframe phase of our business – goes back two decades to the middle 30's, when Interstate was widely known for producing the famous "Cadet" airplanes. As World War II threatened, Interstate expanded to the production of military liaison and training planes. During the war, Lockheed selected Interstate to build the fuselage section of the mighty B-17 Flying Fortress. Before the war ended, Interstate had produced more than $50 million worth of material for the armed forces!

Today bridges an era that began with the production of airframe components for the post-war Douglas AD series and later included the complete fuselage for this series. For the past year and a half, Interstate has been proud of its assignment to build the A3D fuselage.

Tomorrow starts with tomorrow morning and extends to all your future needs for airframe components. Interstate will fabricate and assemble airframe components to the specifications of your company!

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ager of AiResearch Aviation Service. The company can custom-install RCA, Bendix or Collins weather radar systems.

Civil Aeronautics Administration recently approved the company-developed DC-3/C-47 nose modification kit and radome.

AiResearch Aviation Service does not regard itself primarily as an executive interior maker. It is concentrating more and more on general and periodic aircraft overhauls, general aircraft maintenance and repair, along with specialty items.

Cessna Earnings Up. Boost in Dividend

A 45% increase in sales for the first six months of the current fiscal year has led Cessna Aircraft Co. to declare an increase from 25 cents to 35 cents in its quarterly dividend, boosting annual payments from $1 to $1.40.

Cessna sales totaled $33,360,000 for the six months ended March 31, compared to $22,910,000 in the same period last year. The increase was due mainly to business aircraft sales more than doubling; civil aircraft sales of $16,497,000, increased the percentage of Cessna's non-military business to approximately 55%.

Earnings for the first six months were $2.43 per share compared to $1.51 in the same period last year.

The company delivered 1,268 aircraft in the 6 months, compared with 686 units shipped in the like period last year.

Cessna's new tricycle landing gear models 172 and 182 are credited with being largely responsible for the increased volume of commercial business.

Military prime contracts include production of the T-37 two-seat, side-by-side twinjet trainer for U. S. Air Force extending through 1957; Cessna will also put its L-19 Bird Dog two-place liaison plane back into production in July.

On the basis of present contracts, L-19 output will continue through 1957.

Insurance Liberalized For Private Flyers

Liberalized rules for issuance of life insurance to owner-operators of pleasure or business planes are now in effect with 87% of representative underwriters recently surveyed by the Institute of Life Insurance, New York. At the time it made its last survey, in 1948, no companies were known to be issuing

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P-1294, Aviation Week
1125 W. 6 St., Los Angeles 17, Calif.

NEW AIR RESEARCH and DEVELOPMENT COMMAND edition

Including the details, plans and policy of the forthcoming Research & Development program as determined by the 1957 Airpower budget which is now undergoing debate and will become effective July 1, 1956.

Manufacturers and suppliers having a business interest in Research & Development are guaranteed the largest and most significant audience *in this field* through Aviation Week's August 6, ARDC issue. Presenting exclusively the story of this major command, the ARDC issue will include a detailed budget analysis as referred to above with special reports on research in Missile Engineering, Astronautics, Avionics, Super Aerodynamics and Human Factors.

These reports are now being prepared through, on-the-spot writing, by AVIATION WEEK's technical staff (largest and most experienced of any aviation publication) in the 12 research, development and testing centers of the Air Research and Development Command of the United States Air Force.

EXCERPT FROM HEADQUARTERS ARDC LETTER TO AVIATION WEEK.

"There have been so many changes, improvements and advances that another special ARDC issue appears *very timely* and promises to be of the same if not greater benefit and interest than the 1953 edition."

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*AVIATION WEEK average net paid ABC circulation June-December, 1955: 54,548. Paid circulation of current issues: 58,044. Recent readership research by Advertising Research Foundation shows 1.4 readers for every subscriber copy of AVIATION WEEK (readership determined by personal interview using strict recognition test). Current print order 61,898 copies.

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standard rate policies to such applicants.

Major reason for the switch in practice: the air fatality rate among civil pilots has been running about one-third what it was 20 years ago. The Institute reports that one percent of the insurance companies still do not exclude the air risk from policies issued to private pilots, whereas in 1935, two-fifths of the companies checked excluded such a risk or turned down such applicants.

Of the 87% of the companies which now accept private pilots as standard risks, about three-fifths limit the number of hours the applicant is expected to fly annually, generally to 110 hr. per year. The other two-fifths limit expected flying hours and also the amount of insurance issued to about $50,000. Other requirements: that the applicant be at least 27 years old and have 400 hours solo experience. For applicants not meeting these standards, or those that expect to fly over 110 hours annually, extra premiums between $2.50 and $5.50 per thousand are required.

As usual in life insurance underwriting, the acceptance rules apply only to new policies. Where the rule reflects a liberalization of past requirements, the more liberal treatment is generally applied to policies in force. Once a policy has been issued at standard rates, it cannot be limited or rated up, regardless of changes in circumstances.

PRIVATE LINES

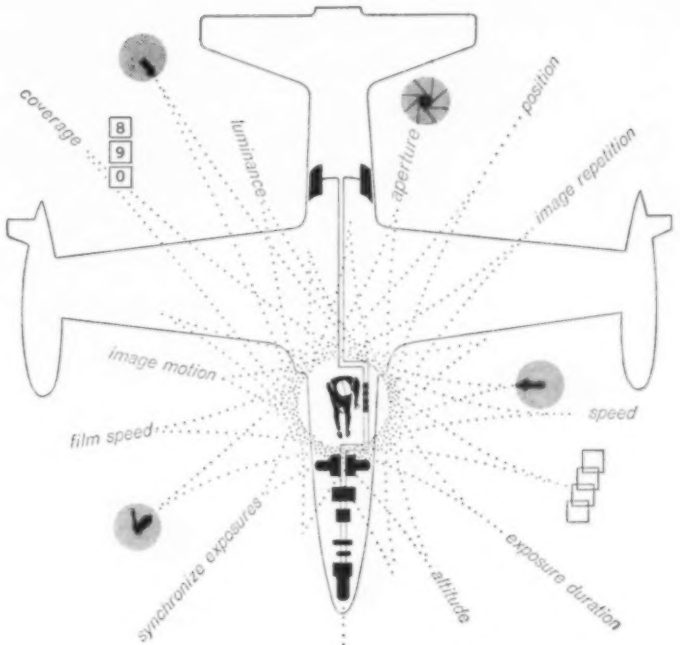
Complete Bendix navigation and communications equipment has been ordered by National Distillers for its new Lockheed Super Ventura by Howard Aero Service, San Antonio, Tex. (AW Jan. 16, p. 80). Included is Bendix RDR-1 X-band radar and DFA-70 direction finding.

Flight of the Flamingos fly-in will highlight Las Vegas (Nev.) Aviation Week June 4-10th. Entry fee of $33 per couple covers double room for two nights and free admission to all parties, shows and other events. For details, write: Flight Committee, Las Vegas Aviation Week, The Flamingo Hotel, Las Vegas.

Air Force letter of intent for inspection and repair as necessary of 45 Cessna L-19 liaison planes has been received by Lear Aircraft Engineering Division, Santa Monica, Calif.

Latest Aero Commander 680 deliveries: Stonnell & Holladay Aircraft Sales, Arlington, Va.; International Business Machines, Poughkeepsie, N. Y.; and Lone Star Cement Co., Bethlehem, Pa.

Jet age photo reconnaissance is a seemingly impossible one man job!



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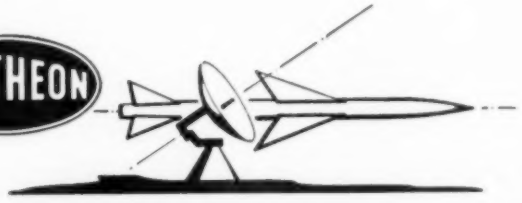


MISSILE SYSTEMS DIVISION—BEDFORD MASS.

WHO'S WHERE

(*Continued from page 23*)

Dr. Horace Jacobs, administrative staff, Lockheed Aircraft Corp.'s Missile System Division's research laboratory, Van Nuys, Calif.

William P. McNally, manager, government products sales planning and proposals; **John J. Ryan,** manager, district operations, W. L. Maxson Corp., New York, N. Y.

John W. Marshall, West Coast sales manager, Hoffman Laboratories, Inc., Los Angeles, Calif.

Dr. Allen M. Peterson, head of Special Techniques Group, Stanford Research Institute's Engineering Division, Menlo Park, Calif.

Walker M. Mahurin, manager-military relations, Northrop Aircraft, Inc., Hawthorne, Calif.

C. F. Mason, sales director, Com-Air Products, Inc., Los Angeles, Calif. Also: **H. H. Reinhart, Jr.,** contract administration; **L. E. Tomlinson,** engineering director; **Harry C. Foster,** chief engineer.

Dr. John D. Stanitz, chief engineer, Accessories Division, Thompson Products, Inc., Cleveland, Ohio, succeeding **Leslie L. Aspelin,** engineering manager.

Gavin A. Cullen, general manager, International Business Machine's new San Jose, Calif., plant.

David E. Midgley, general traffic manager and **Henry Fellows,** general manager-sales research, Trans World Airlines.

Dr. John Sterner, director-flight test operations, Guided Missile Research Division, Ramo-Wooldridge Corp., Los Angeles, Calif.

Vernon B. Benfer, general manager, Aircraft Engineering Division, Lear, Inc., Santa Monica, Calif.; **Sam F. Arn,** division manager-sales and contracts.

Louis Fahnestock, director, projects administration, Fairchild Aircraft Division, Fairchild Engine & Airplane Co., Hagerstown, Md.

John T. McGraw, chief engineer, aircraft engineer, aircraft products, Axelson Division of U. S. Industries, Inc., Los Angeles, Calif.

Ahlert P. Stuhrman, quality control director, Consolidated Electrodynamics Corp., Pasadena, Calif.

Fred Andrew, sales manager, Electro-Aire Division, Hydro-Aire, Inc., Burbank, Calif.

George R. Davis, maintenance director, Bonanza Airlines.

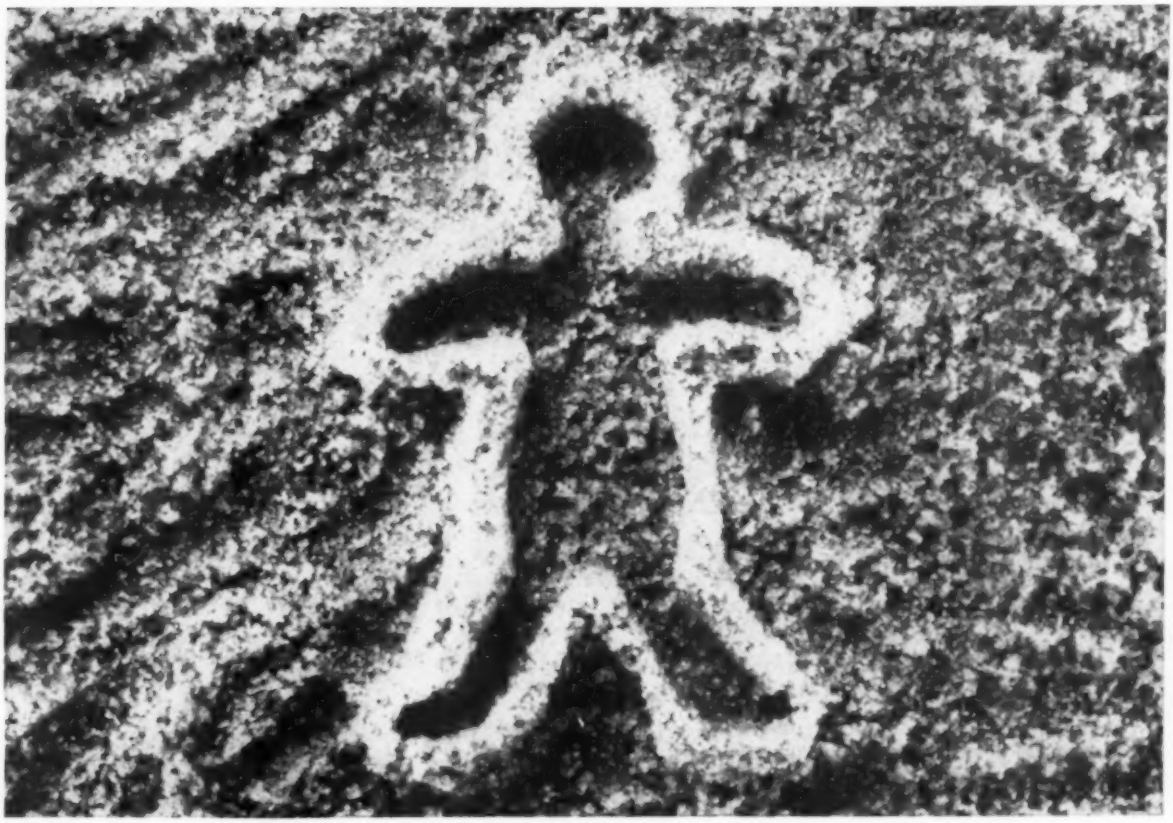
Dr. Clarence F. Kooi, senior scientist, Missile Systems Division, Lockheed Aircraft Corp., Van Nuys, Calif. Also: **Dr. Alexander Dessler,** and **Dr. Mendel Sachs.** Associate research scientists: **Dr. Calvin H. Wilcox;** research scientists: **Dr. Robert W. Bagley** and **Dr. Edison Greer.**

J. F. (Skeets) Coleman, customer relations staff, Fairchild Engine & Airplane Corp., Hagerstown, Md.

Arthur C. Deichmiller, quality control manager, MB Manufacturing Co., New Haven, Conn.

Gerald J. Widawsky and **Hershel Toomim,** national sales manager and general manager respectively, Electrosolids Corp., N. Hollywood, Calif.

Gordon W. Ray, sales administration director, Trans World Airlines.



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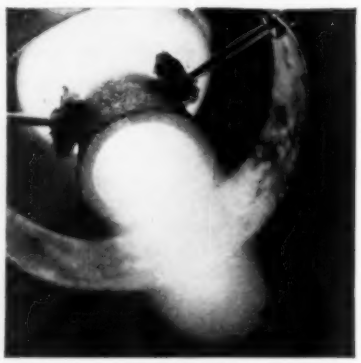

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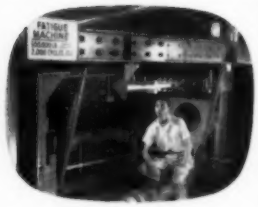

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P-1574, Aviation Week
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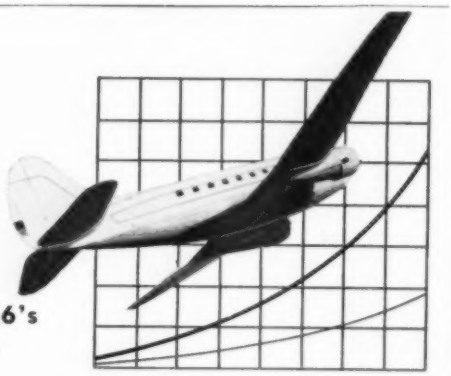

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38	922E	Switch
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3	U-945	Fuel Strainer
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52	4802	Switch
1080	4808	Contactor
200	A812	Solenoid
349	M826	Switch
35	4847R	Rear View Mirror
102	4851-6	Fitting
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4	4625	Cylinder
4	650-1535	Relay
4	650-1691	Relay
8	650-1759	Relay
8	653	Relay
25	M654	Valve
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2310	D506	Servo Control Valve
5	M506MT	Cylinder
26	4506	Ammeter
12	525-LFG-1 8D	Valve
19	U532	Relay
215	B541	Bearing
299	560B32D	Switch
385	MOD 564-2A	Oil Separator
2	586BK-0115	Air Speed Indicator
73	AL 599	Drive Assy.
163	A406M3	Switch
75	M409 MOD 44C	Gear Box
15	PR412-7	Purolator
22	4417	Switch
23	424AG2	Camera Coupling
3	426-1E	Motor
3	426-10A	Starter
42	430R	Pump
3	WE432-10	Valve
39	4450	Plug
377	G464	Cog
29	R300	Gear Box
9	C322	Filter
104	AS333/AP	Antenna
31	345 D.C.	Relay
7	WM390-1 12 D	Valve
10	C-200JB (4R19)	Switch
57	T-200	Transmitter
267	RP202FE350KK	Rheostat
1939	2066PL-20	Mount
16	212-7-12	Ohmite Switch
66	4228	Unloader Valve
16	4837 EAU	Relay
87	RP252FE-350KK	Rheostat
147	258E4600028	Honeycomb Assy.
61	U866A	Solenoid
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241	CA275X	Condenser
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8	AA37001	Valve
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621	SA107A39	Teleflex Control
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280	145-AS-1	Take Up Reel
27	C145-25-16A	Fitting
104	U148	Relay
274	PL151	Plug
57	RP151-FE350KK	Rheostat
106	SKHX-155	Relay
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38	155-S2-4D	Coupling
80	155-S2-4S	Coupling
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14	SK16	Valve
7	G16A2CA21	Pressuretrol
79	BX17-16	Transformer
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42	SF5RN-2	Magneto
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90	1077	Relay
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10	D1100-D-1A	Valve
16	D1100-D2	Valve
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194	NAF1160-1	Tee
100	NAF1204-1	Relay
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232	IV40-210	Iris Valve
75	40R493	Valve
463	40R1201	Solenoid Valve
48	EA41-A2	Indicator
154	BX42-7	Dynamotor
53	44A	Gear Box
102	44C	Gear Box
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26	MS49A	Antenna Switch
60	4986757	Adapter
872	4986768-5	Circuit Breaker
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3454	2157A	Cannon Solenoid
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695	2322-3	Cap
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12	2432-3	Selector Valve
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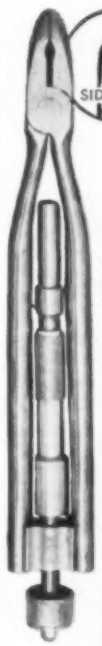

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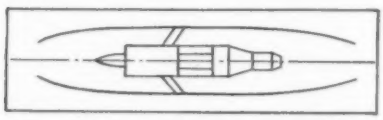
LETTERS

Tu-104 Clues

Your article on the Tupolev 104 was very interesting reading. There were five clues in the article concerning the engine installation, all appearing on the second page, quote: (1) "Rolls-Royce designers calculated the diameter of the huge air intakes as 40 inches, (2) The exhaust nozzle diameter is calculated at three feet, (3) Overall length of the engine nacelle is approximately 40 feet, (4) and maximum diameter is five feet. (5) . . . the engines seemed unusually quiet in view of their size, although there was no indication of silencers."

In the writer's opinion, there is one engine installation that fits the five clues very well: a ducted engine. Such an installation might look like the following sketch:



The advantage of such an installation would be: (1) increased thrust, (2) reduced sfc, (3) reduced engine noise level. WILLIAM R. SPENCER, Technical Engineer General Electric Co., Cincinnati, Ohio

AW 'Addict'

As a highly satisfied subscriber to "AVIATION WEEK" I have been desirous of writing you for quite some time.

It is strange to say that one can become "addicted" to a magazine; but after reading each issue, I actually become impatient for the next Monday to arrive. The reason for this should be apparent to you, as the Editors, and can be evidenced from your constantly increasing circulation. "AVIATION WEEK" is, without question, the finest and most complete magazine devoted to the Aviation Industry—compiled by, for, and concerning, *The* Industry in all its areas, phases, and divisions. I am so enthusiastic about your publication that I find it impossible to portray my attitude on paper to you.

Being personally concerned myself, to a great degree, with Business Flying and Executive utilization of aircraft; I naturally find your articles pertaining to these areas most interesting and enlightening. The fact that you are devoting more space to the group who lead all fields in Hours Flown per Year—The Business Aircraft owners, operators, and pilots—is a source of satisfaction to me. "AVIATION WEEK", in addition to the NBAA and AOPA have become not unlike the Business Flyers' and Private Flyers' Joan of Arc. "AW" has exposed to the World, vividly and constantly, that there is another group, other than the Military and the Airlines, who more than deserve consideration by the CAB, CAA, and other Federal Agencies. In this, and every other area, you are worthy of great merit for your excellent presentations. The viewpoints and "stands" expressed in "AVIATION WEEK's" numerous editorials and articles speaks highly of your conformity and ideals with the ultimate function of a Publisher—the dissemination of information and data in an impartial manner, acting only as a medium of expression and the necessary function of an arbitrator.

Aviation Week welcomes the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

Accident Reports

One of your policies which most assuredly deserves mention at this time, is your practice of publishing the CAB Accident Investigation Reports—word for word. I do not wish to appear "ghoulish", but all who are involved in Aviation to any degree whatsoever can learn a great amount of information from these reports—if they utilize some introspection as to where *they* could be involved in a similar situation. I, as a Commercial Pilot with Instrument Rating have made a long list of "Do's" and "Don't's" from the wealth of knowledge to be gleaned from these Reports. If we are not able to learn from others' experiences, then, someone wiser than ourselves will probably learn from ours.

For a long time I have enjoyed, anticipated, and been stimulated by, Captain Robson's weekly article, "Cockpit Viewpoint". The column has always been pertinent and sympathetic to the "trials and tribulations" of The Pilot—whether or not he be Airline, Business, or Private. In fact, Captain Robson has almost inevitably expressed some thought or "beef" that had previously occupied my own thoughts at one time or another. What happened to Captain Robson? "Cockpit Viewpoint" has been absent from the past number of issues. I miss it to a large degree and, judging from frequent "Letters to The Editor" reprints, so must many others find this superb article missing in their "AW's". I have often seen comments from your readers making specific reference to some idea the Captain had expressed in his column. If a staff writer can draw such a response from "AW's" readership, is he not a valuable asset?

Perhaps some of the "powers that be" of Air Traffic Control had Captain Robson removed from circulation because of his latter articles on Radio Communication problems of today's pilots, as well as a few "jabs" at ATC with respect to Air/Ground Communications and the difficulties imposed by ATC, at times, in Position Reports. (This last thought is nothing more than sarcastic humor, honest!) Seriously, though, I'm sure Captain Robson was not unduly criticizing ATC. In my opinion he was only airing the "gripes" of a Pilot, and offering them in a pleasantly readable manner. ATC has its problems, too, to say the least, and I am certain that both groups only wish to alleviate this constantly increasing difficulty in Terminal Areas. Bringing these matters to a "head" as Captain Robson used to do will most likely precipitate a solution more quickly than pure silence would do.

Keep Robson

If, perchance, Captain Robson happens to be on a vacation of some type—you have my sincerest apologies for accusing you, or others, of "skullduggery". However, if it was "AVIATION WEEK's desire to discontinue the "Cockpit Viewpoint" article, then you have my displeasure for this apparent lack of taste in editorship. It is the only possible criticism of "AW" that I can find, but this does not deter the magnitude of your singular "crime". Let's be friends again—BRING CAPTAIN ROBSON'S COLUMN, "COCKPIT VIEWPOINT" BACK AGAIN.

In closing, and assuming you will utilize your supreme judgment in the aforementioned matter, I wish to thank you for the countless hours of pleasurable and education reading "AVIATION WEEK" has afforded me. To know that every Monday I will be brought up to the minute on the *entire* Avition Industry in its full scope, by reading "AVIATION WEEK", shall keep me a contented subscriber ad *infinitum*.

ROBERT D. ADLER, President
Rotor Airlines, Ltd., 122 East 42nd St., New York 17, New York

(Capt. Robson's column "Cockpit Viewpoint" is a regular feature of AVIATION WEEK's *transport section and will continue as such. Capt. Robson is an airline pilot with a full schedule of transport flying and his writing must be sandwiched in between his airline duties. This accounts for occasional lapses in the appearance of his column.—Ed.)*

Engineer's Pay

I have to laugh at all the complex and varied reasons given for this engineering shortage. It's quite simple. Engineering companies are in this predicament today because in the past they have paid their engineers the absolute minimum they could get away with. This built up a very wide spread knowledge among all people that engineers were very poorly paid, and this in turn made many people feel that an engineer was a very inferior person professionally. I have heard several parents in the past saying that if they were going to spend all that money to send their son to college, they wanted him to be a doctor or a lawyer but not an engineer because "engineers are a poor lot".

All of a sudden management is willing to turn its pockets inside out to get engineers. They are offering brand new engineers $400 a month. This is quite an intesting fact when you consider that my husband has been an engineer— and is considered a good one—for 15 years and is only making $700 a month. And there are lots of 10 and 15 year men that are making even less than $700 a month. Do you think that if we had had a son we would have encouraged him to go into engineering?

NAME WITHHELD

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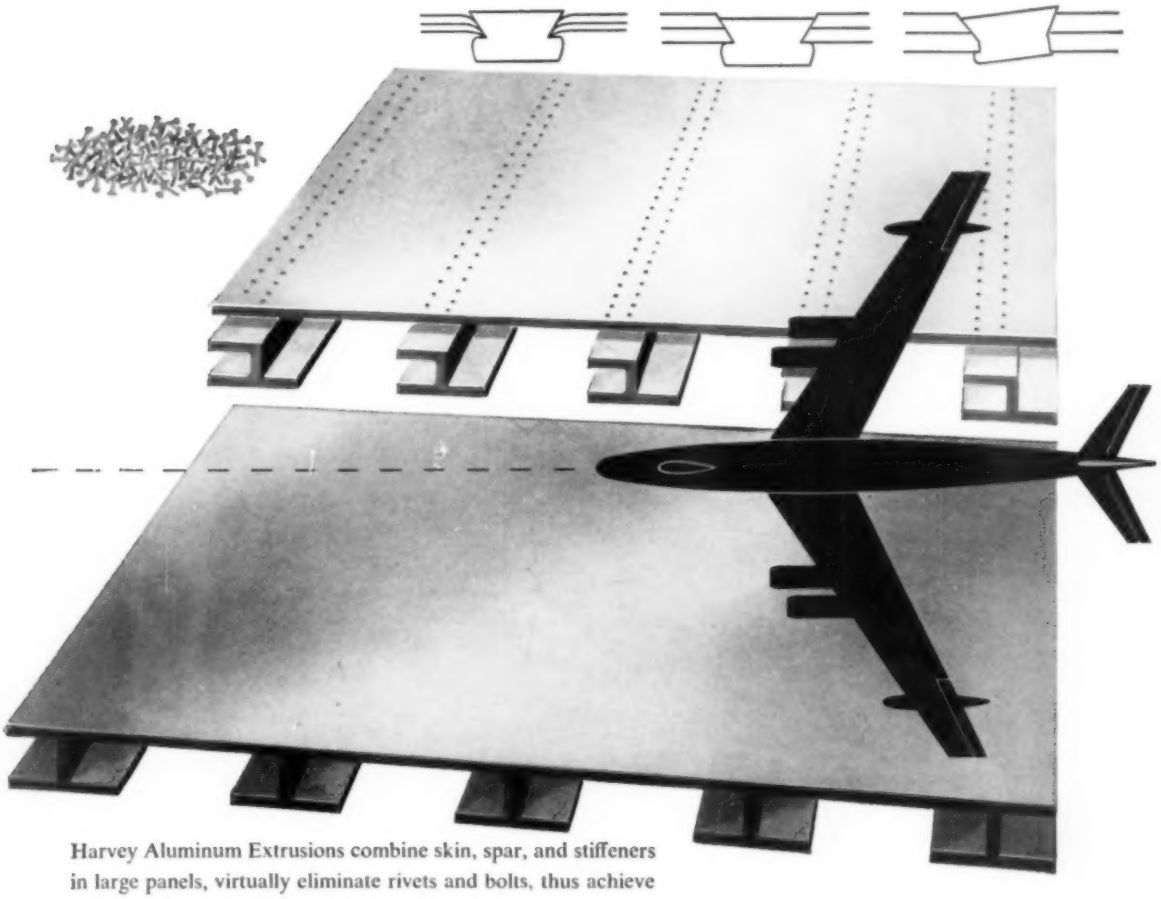

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